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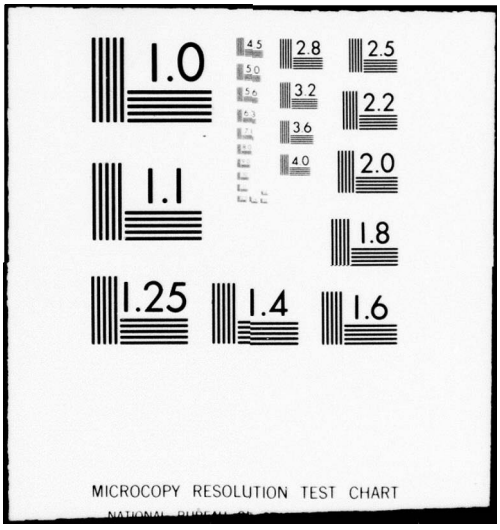
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MICROCOPY RESOLUTION TEST CHART

Report No. FAA-RD-79-42

LEVEL II

# CENTRAL FLOW CONTROL OPERATIONAL SUPPORT SYSTEM USER'S MANUAL HRT REDUCTION PROGRAM (REDUC)

AD A069813

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16. Abstract

This document describes the functions of the High Resolution Timer (HRT) Reduction Program (REDUC) and details the procedures required to exercise them. This document is an update to NASP-9211-06 for the Central Flow Control (CFC) facility. Modifications to the REDUC program were made for compatibility with OS/MVT.

REDUC reduces data relevant to the internal operation of the CFC Monitor, including Compute Element (CE) time used for: 1) I/O interrupts, 2) external interrupts, 3) timer interrupts, and 4) Supervisor Service Calls (SVC). Output reports enable identification of frequently used programs and facilities; this information provides the basis for system tuning operations.

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# METRIC CONVERSION FACTORS

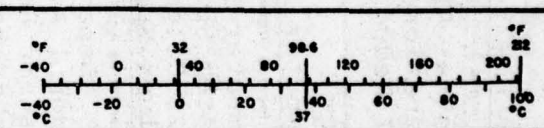
## Approximate Conversions to Metric Measures

| Symbol | When You Know | Multiply by | To Find | Symbol |
|---|---|---|---|---|
| | | **LENGTH** | | |
| in | inches | *2.5 | centimeters | cm |
| ft | feet | 30 | centimeters | cm |
| yd | yards | 0.9 | meters | m |
| mi | miles | 1.6 | kilometers | km |
| | | **AREA** | | |
| $in^2$ | square inches | 6.5 | square centimeters | $cm^2$ |
| $ft^2$ | square feet | 0.09 | square meters | $m^2$ |
| $yd^2$ | square yards | 0.8 | square meters | $m^2$ |
| $mi^2$ | square miles | 2.6 | square kilometers | $km^2$ |
| | acres | 0.4 | hectares | ha |
| | | **MASS (weight)** | | |
| oz | ounces | 28 | grams | g |
| lb | pounds | 0.45 | kilograms | kg |
| | short tons (2000 lb) | 0.9 | tonnes | t |
| | | **VOLUME** | | |
| tsp | teaspoons | 5 | milliliters | ml |
| Tbsp | tablespoons | 15 | milliliters | ml |
| fl oz | fluid ounces | 30 | milliliters | ml |
| c | cups | 0.24 | liters | l |
| pt | pints | 0.47 | liters | l |
| qt | quarts | 0.95 | liters | l |
| gal | gallons | 3.8 | liters | l |
| $ft^3$ | cubic feet | 0.03 | cubic meters | $m^3$ |
| $yd^3$ | cubic yards | 0.76 | cubic meters | $m^3$ |
| | | **TEMPERATURE (exact)** | | |
| °F | Fahrenheit temperature | 5/9 (after subtracting 32) | Celsius temperature | °C |

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.

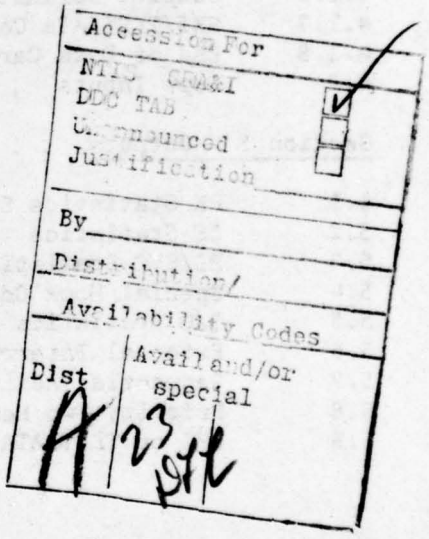
## Approximate Conversions from Metric Measures

| Symbol | When You Know | Multiply by | To Find | Symbol |
|---|---|---|---|---|
| | | **LENGTH** | | |
| mm | millimeters | 0.04 | inches | in |
| cm | centimeters | 0.4 | inches | in |
| m | meters | 3.3 | feet | ft |
| m | meters | 1.1 | yards | yd |
| km | kilometers | 0.6 | miles | mi |
| | | **AREA** | | |
| $cm^2$ | square centimeters | 0.16 | square inches | $in^2$ |
| $m^2$ | square meters | 1.2 | square yards | $yd^2$ |
| $km^2$ | square kilometers | 0.4 | square miles | $mi^2$ |
| ha | hectares (10,000 $m^2$) | 2.5 | acres | |
| | | **MASS (weight)** | | |
| g | grams | 0.035 | ounces | oz |
| kg | kilograms | 2.2 | pounds | lb |
| t | tonnes (1000 kg) | 1.1 | short tons | |
| | | **VOLUME** | | |
| ml | milliliters | 0.03 | fluid ounces | fl oz |
| l | liters | 2.1 | pints | pt |
| l | liters | 1.06 | quarts | qt |
| l | liters | 0.26 | gallons | gal |
| $m^3$ | cubic meters | 35 | cubic feet | $ft^3$ |
| $m^3$ | cubic meters | 1.3 | cubic yards | $yd^3$ |
| | | **TEMPERATURE (exact)** | | |
| °C | Celsius temperature | 9/5 (then add 32) | Fahrenheit temperature | °F |



## PREFACE

This is an update to NASP-9211-06 for the Central Flow Control (CFC) Facility. Modifications to the REDUC Program were made to provide compatibility for executing REDUC on the 9020A System under OS/MVT.



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## ABBREVIATIONS

| | |
|---|---|
| BAL | Basic Assembly Language |
| CE | Computing Element |
| CFC | Central Flow Control |
| DAR | Diagnose Accessible Register |
| EBCDIC | Extended Binary-Coded Decimal Interchahge Code |
| HEX | Hexadecimal |
| HRT | High Resolution Timer |
| I/O | Input/Output |
| IOCE | Input/Output Control Element |
| MLC | Merged Library/Compool |
| NAS | National Airspace System |
| NOSS | NAS Operation Support System |
| PCI | Program Control Interrupt |
| PE | Program Element |
| PIR | Processor Interruption Register |
| PSW | Program Status Word |
| REDUC | HRT Reduction Program |
| SIO | Start I/O |
| SPT | Symbolic Program Tape |
| SVC | Supervisor Service Call |
| TAR | Timing Analysis Report |

# SECTION 1 - INTRODUCTION

## 1.1 Purpose and Scope

The HRT Reduction Program (REDUC) reduces a data tape created by the Timing Analysis Report Program (TARP). This tape, called the High Resolution Timing (HRT) tape, contains data relevant to the internal operation of the Central Flow Control (CFC) Monitor, including the Compute Element (CE) time used for I/O interrupts, external interrupts, timer interrupts, CE time used by each Program Element (PE), and by each Supervisor Service Call (SVC) by every PE. This data is reduced to a meaningful form by REDUC.

This information originates on the Systems Analysis Recording (SAR) tapes created by the CFC Monitor, which are input to TARP. Through an option in TARP, the Timing Analysis Records (TAR) on the SAR tapes are used to produce an HRT formatted tape.

REDUC was originally designed to reduce data created by the HRT program, a programmer tool used to measure performance of the NAS Monitor. The HRT program is not used on the CFC Project at this time.

The purpose of the HRT Reduction Program is to reduce these tapes, and to generate reports which are easy to understand and interpret. The output reports are designed to enable the analyst to tell at once which programs are most frequently used, which programs consume the most CE time per execution, and which programs utilize the most total CE time. These results will be of immeasurable value in deciding which programs to review when the total CE time must be reduced or in deciding which programs are good candidates to be buffered.

Optionally, the user may request an SMI or TESTDATA formatted tape be written to produce CPU histograms under NOSS. Special SMI or TESTDATA reduction program control decks are available which will produce histograms similar to those available when using the SMI. In addition, frequency count histograms are available for I/O interrupts, SVC interrupts, external interrupts, and number of dispatcher. These control decks are not currently available under OS/9020.

Figure 1-1 presents an overview flowchart of the REDUC Program.

## 1.2 Background Information

The user is expected to have a minimal effective knowledge of OS and the equipment used to operate this system. Any terms which are common to OS will not be defined in this User's Manual.

This program is assumed to be correct in the statistics which it gathers, reduces, and prints; i.e., all data is gathered correctly and all reports are produced in an error-free environment. This does not assume that the CFC Monitor and its operational hardware are error-free. There are many measurements taken to determine the effect of non-error-free systems such as program interrupts, hardware interrupts, etc.

## 1.3 References

The following documents may help the programmer use this manual:

1. Subprogram Design Document, HRT Reduction Program (REDUC), NASP-9111-latest revision, National En Route Data Systems Branch, AAT-540, Atlantic City, New Jersey.

2. CFC Monitor Handbook, NASP-5201-latest revision, Contract FA65WA-1395, IBM Corporation, NAFEC, Atlantic City, NJ.

3. TARP User's Manual, NASP-9227-latest revision, National En Route Data Systems Branch, AAT-540, NAFEC, Atlantic City, NJ.

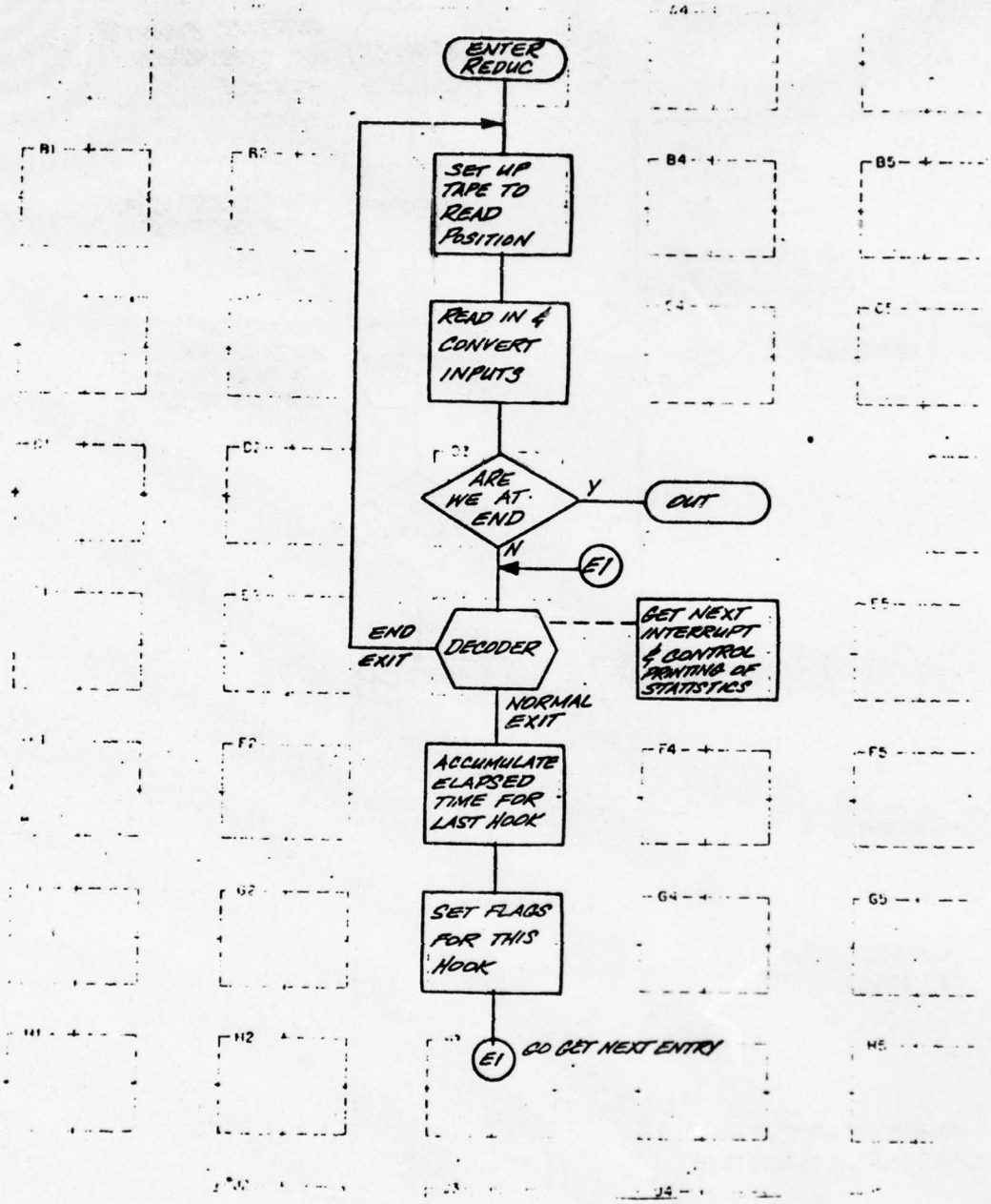



FIGURE 1-1. REDUC OVERVIEW FLOW CHART (SHEET 1 OF 2)

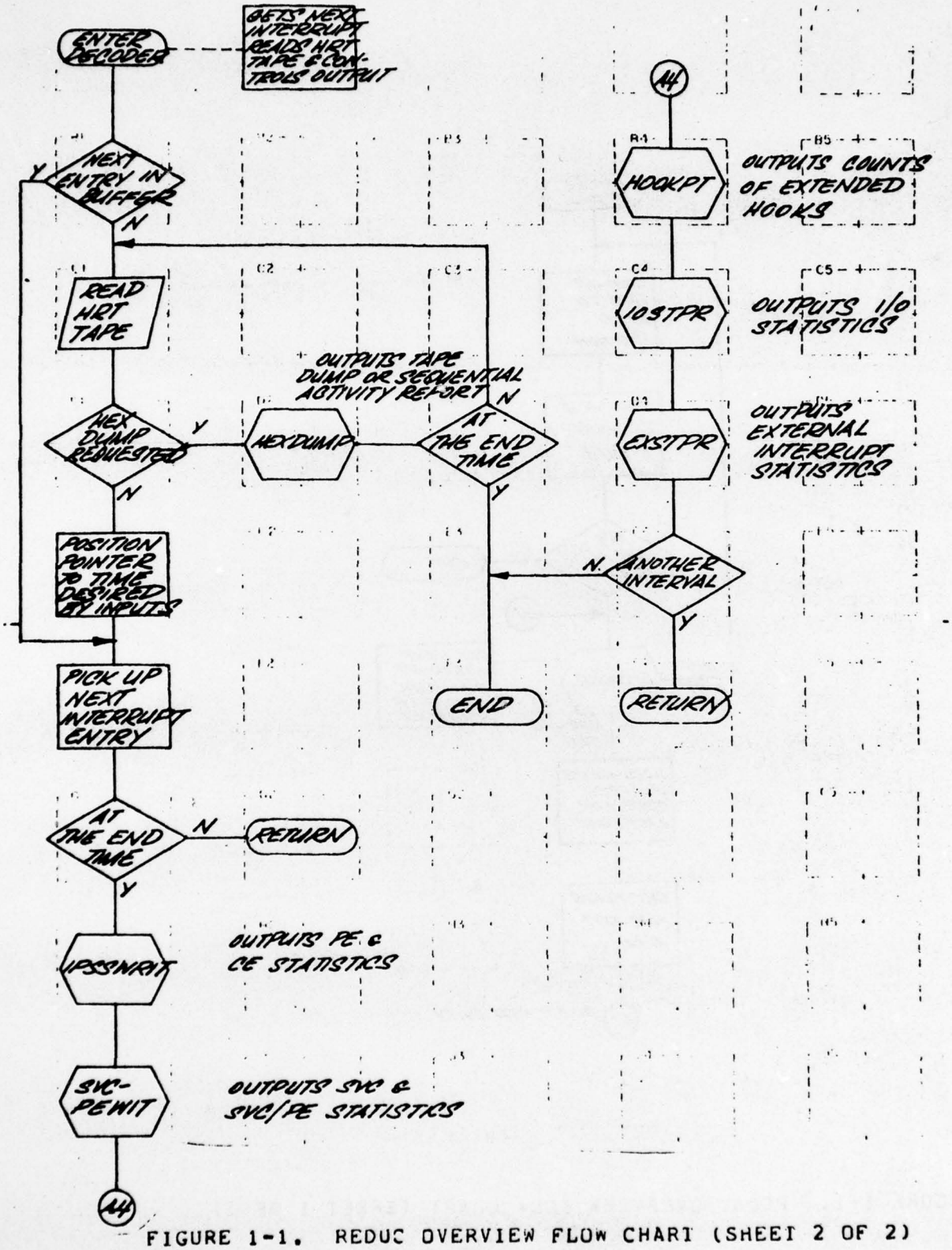



FIGURE 1-1. REDUC OVERVIEW FLOW CHART (SHEET 2 OF 2)

## SECTION 2 - PROGRAM ENVIRONMENT

REDUC is designed to be executed on the IBM 9020A under OS/MVT. Throughout this manual, references are made to HRT tape input, printed output, control cards, and output tapes for convenience as, under OS, REDUC is not bound to specific peripheral device types. REDUC requires a 424K byte region for execution and for normal operation, a maximum of two tape drivers, one for HRT tape input and one for tape output. Figure 2-1 shows sample JCL for executing REDUC.

Input data sets to REDUC include the control card set (input on SYSIN) and the HRT data (input on HRTTAPE). These two input sets are required and must be specified by the DDNAMEs indicated.

A print file supplied by the REPORT DD card is a required output file. Two additional output sets specified by the DDNAMEs SMITAPE and TESTDATA are optional files. SMITAPE is required only if the creation of an SMI tape is specified by the control card information. TESTDATA is required only if a TESTDATA tape is to be generated. The data set attributes (DCB parameters) for these two optional files are supplied by the REDUC program. Control cards for executing REDUC are discussed in Section 3.

```
//   EXEC PGM=REDUC,REGION=424K
//STEPLIB DD DSN=RA.LIB.NOSS.LOAD,DISP=SHR
//HRTTAPE DD UNIT=(TAPE,,DEFER),DISP=OLD,
//   DCB=(RECFM=U,BLKSIZE=10056),VOL=SER=XXXXXXX
//REPORT DD SYSOUT=A
//SMITAPE DD DSN=SMITAPE,UNIT=(TAPE,,DEFER),DISP=(,KEEP),
//   LABEL=(,SL)
//TESDATA DD DSN=TESTDATA,UNIT=(TAPE,,DEFER),DISP=(,KEEP),
//   LABEL=(,SL)
//SYSIN  DD *

    control card input
```

Figure 2-1. Sample JCL

## SECTION 3 - PROGRAM OPERATION

This program will compute the total CE utilization by the CFC Monitor as it is operating under various load conditions. This utilization can be broken down by CE to the amount of time used for each type of activity. The outputs for CE activity will include: the total percentage of time the CE was executing a PE; the total percentage of time the CE was performing SVCs which were not suspended; the total percentage of time the CE was performing SVCs which were suspended; the number of I/O interrupts; the total percentage of time the CE was performing I/O activity; the number of external interrupts which the CE experienced; the total percentage of time the CE was used to service these external interrupts; the number of times a CE dispatched some PE; the total time which the CE spent in the dispatcher; the total percentage of time spent idle; and the total percentage for HRT overhead. The total percentages will be equal to 100%. If more than one CE is used, as is the case in a multi-CE environment used for a normal NAS load, there is also a total printed for the combined computation of all CEs.

Another breakdown of the utilization will be by PE. This will include a listing of all PEs used by the CFC Monitor for this load during the period of the statistics printed. Included with each PE will be the number of times it was dispatched, the number of partial executions, the mean execution time per completed dispatch, the standard deviation of the execution time, the accuracy of mean execution time, and the total percentage of available time of one CE the PE used regardless of how many CEs may have been used to execute the PE. Also included for each PE will be the percentage

of execution time used for both non-suspended and suspended SVCs. Finally, there is the total percentage of one CE used for each PE, which includes both PE execution time and SVCs. Refer to Section 5 of this User's Manual for the actual format of the outputs.

If desired, a further breakdown is possible. This breakdown will consist of all SVCs called and the PEs that called them. This output is arranged so that each PE will be on a separate page, with a listing of all the SVCs that PE uses. The first page of this additional output will be a listing of the total SVCs used by all PEs. For each SVC, there will be the number of executions of the SVC, the mean time of execution for each use of that SVC, the standard deviation of the time of execution and the total percentage of one CE's time used for all executions of that PE. This detailed breakdown of SVCs for each SVC/PE combination is for both non-suspended SVCs and those which were suspended.

Also included for those SVCs which were suspended will be a count of the number of times an attempt was made to retry this SVC. If this detailed listing of SVCs for each PE is not desired, a listing may be made of only those PEs that are required. Refer to Section 4 of this User's Manual for details on how this can be accomplished.

The HRT has the ability of accepting as input user-defined special hooks. These hooks can be placed within the CFC Monitor at points which the user determines to be of special significance. When the CFC Monitor encounters one of these special hooks, a TAR record is written on the HRT tape. This HRT Reduction Program will count the number of times each of these hooks is encountered. If there was an encounter of a special hook during

the time interval just reduced, a special page of output will be generated listing each special hook encountered and the number of times it was encountered. The user has the option of printing a comment of his choice by each special hook printed. If no user comments are entered, only a count of the hooks will be printed. User comments for hooks which were not encountered will be ignored. Refer to Section 5 of this User's Manual for information regarding the various types of output possible.

Another report that will be generated by REDUC is for I/O statistics. This report will show for each device number accessed by NAS the number of Start I/O (SIO) commands, the frequency of SIO commands per second, the number of device ends received, the number of channel ends received, the number of channel ends with device ends received, and the number of other interrupts received for that device. Program REDUC will also compute and report for each device the mean time between SIO and device end, the standard deviation, the accuracy of the mean, and the total percentage of time that device was being utilized.

This report has subtotals of these statistics by control unit, channel, and I/O Control Elements (IOCE). The report also has a grand total of these statistics for the system. Refer to Section 5 of this User's Manual for the actual format of the output.

Program REDUC will also produce a report on external interrupt statistics. This report will have a separate line for each unique external interrupt type combination that occurred on each CE during the operation of the

CFC Monitor. The REDUC program allows for any combination of external interrupt types of the possible codes used in NAS which are as follows:

XX1 = Diagnose Accessible Register (DAR)

XX2 = Processor Interruption Register (PIR)

XX4 = Write Direct from CE4

X1X = Write Direct from CE3

X8X = Timer

1XX = Write Direct from CE2

4XX = Write Direct from CE1

These are from bit positions 20-31 of the Program Status Word (PSW). An example of one possible external interrupt would be CODE=094=Write direct from CE3 and CE4 with a timer interrupt.

For each reported code combination, REDUC will show the type code, the CE which took the interrupt, the number of times this same code combination occurred on this CE, the frequency of its occurrence, the mean time to process the interrupt, the standard deviation of the processing times, the accuracy of the reported mean time, and the percentage of total utilization taken to process these interrupts. A total line will also be reported that will show these same statistics as they apply to the total of all external interrupts taken during the reported interval. Refer to Section 5 of this User's Manual for the actual format of this report.

As an alternative to the above reports, a user can receive either a hexadecimal dump of the tape records for a specified period of time or a sequential activity report which is an interpreted tape dump. The

hexadecimal tape dump is a printout of the raw HRT tape records from the first record containing interrupts of the desired period to the last record containing interrupts of the desired period. This printout is in six columns where the first is the byte displacement from the beginning of the record and the other five are each a logical doubleword record of the HRT tape. This report allows up to 330 doubleword logical records per page of output.

A sequential activity report is produced as an option of REDUC. This report has three columns which are of the hexadecimal dump format with column one the byte displacement from the beginning of the record and columns two and three the first and second words of a single doubleword logical record. The other columns of this report are an interpretation of the information available about the single logical record.

Column four of this report is the interpreted PE identification of the logical record. Following the PE identification is an interpretation of the two byte interrupt code. Next in the report line is the decimal microseconds translation of the HRT Overhead. This overhead is presented as new overhead and skipped overhead. The new overhead is the time, in microseconds, HRT used to produce the current interrupt entry and the skipped overhead is the total overhead HRT used to produce those interrupt entries which may have been skipped because of entry filtering, as described below. When there have been no entries filtered out between the last line of the report and the current line, the SKIP will be zero. When there have been entries filtered out between the last line of the report and the current line, the skip value will be

the total time, in microseconds, spent in HRT to produce those skipped entries. This SKIP value should be deducted from the DELTA value if the user wishes to obtain the DELTA time minus HRT overhead between two lines of the report.

The columns of the report following "DELTA=" are the number of microseconds in decimal which elapsed from the previously reported interrupt on the CE until the present reported interrupt on that CE. There are four columns available here; one column for the delta time of each CE. This delta time is computed from the moment HRT gives up control to the CE until HRT again receives control of the CE. In theory, this time is the same as the time which would have elapsed had HRT not been present in the system to record the events. A fifth column here is to present the DELTA time between two consecutive reported interrupt entries without regard to the CE. This delta time may at times be a reported negative time because HRT will often receive an interrupt on one CE before completing an interrupt entry for a previous interrupt on a different CE. In this case, the time from when HRT gives up control until when it again gains control is in fact a negative DELTA. The final column of the report is the computed time of day each entry was created. This time is presented as HH:MM:SS.S for each internal interrupt on the master CE, where HH is hours, MM is minutes, and SS.S is the seconds to the half second. Between any two such presentation of the time the report will be .XXXXXXX which is the time, in microseconds, past the last reported second.

For the actual format of this sequential activity report, refer to Section 5 of this User's Manual.

Program REDUC also has an option to produce an SMI or TESTDATA formatted tape. See Section 4.1.7 for the type 7 card used to invoke this option.

# SECTION 4 - INPUT

The inputs to the reduction program give this program the information to be reduced as well as what type of reports are to be generated. This User's Manual goes into considerable detail on the various inputs to enable the user to obtain the desired results. Input can be divided into two logical divisions: card input and tape input. The tape used as input will be the HRT formatted tape to be reduced.

## 4.1 Card Inputs

Card inputs are for two purposes. The first card input of comments to be printed on the output is to make the results more meaningful. Any valid Extended Binary-Coded Decimal Interchange Code (EBCDIC) character may be used on these cards. The second purpose for card inputs is to tell the REDUC program what to reduce and how to produce the output reports. Some of these inputs are required, while others are optional and needed only when the user desires. The only requirement is that all control cards and comment cards for an interval be presented before the Data Interval Card.

### 4.1.1 Comment Cards

Card column 1 of the comment card must be non-numeric. The rest of the card may be any EBCDIC characters of the user's choice.

### 4.1.2 Data Interval Cards

The Data Interval Card is required for all runs. There are five major options which are selected with this card. If column 1 is a 1, a signal is generated to carry the statistics for each interval to the next from Start Time to End Time. With this option, each report will include the

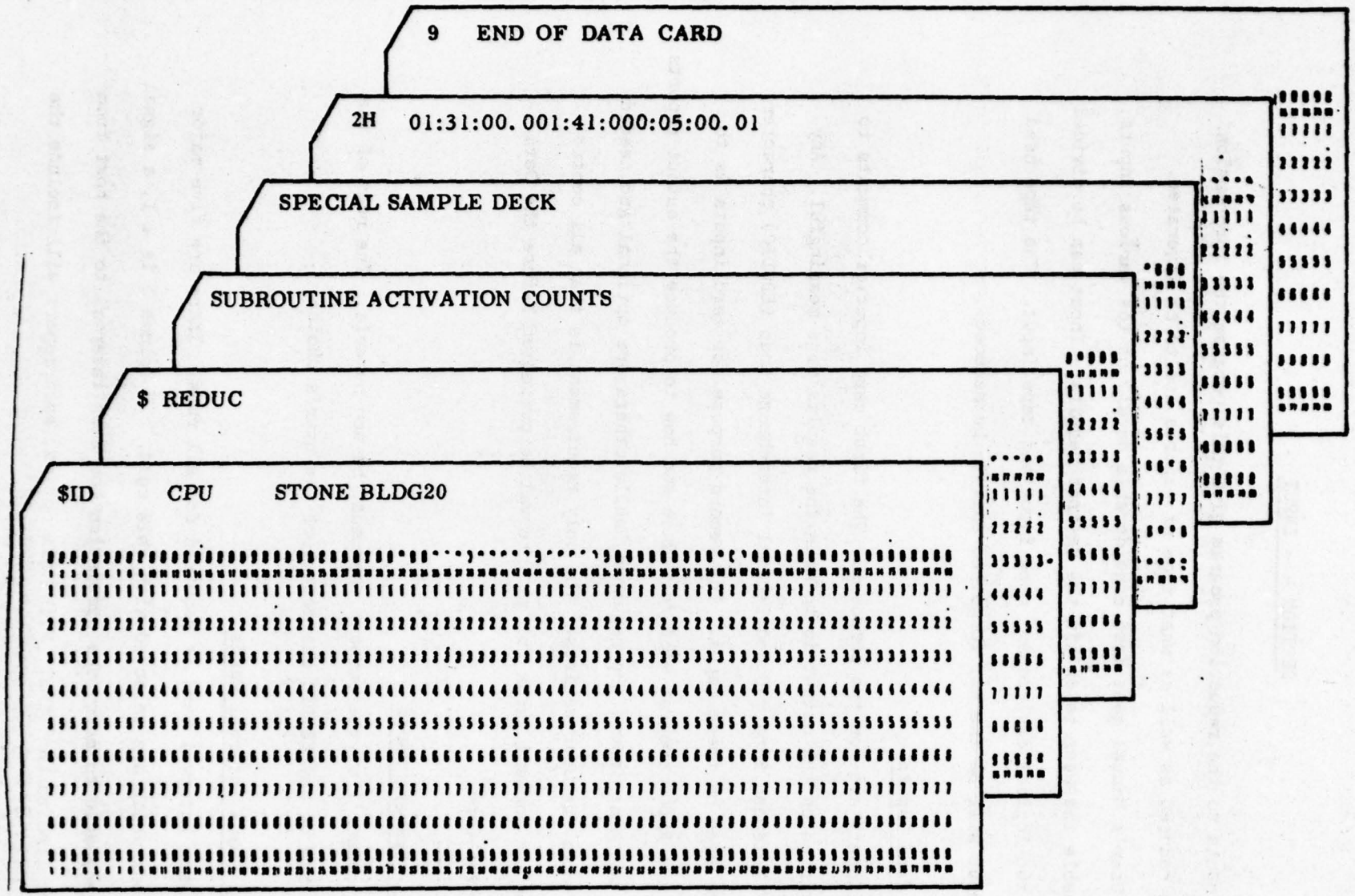



FIGURE 4-1. SAMPLE OF CARDS FOR MINIMUM RUN

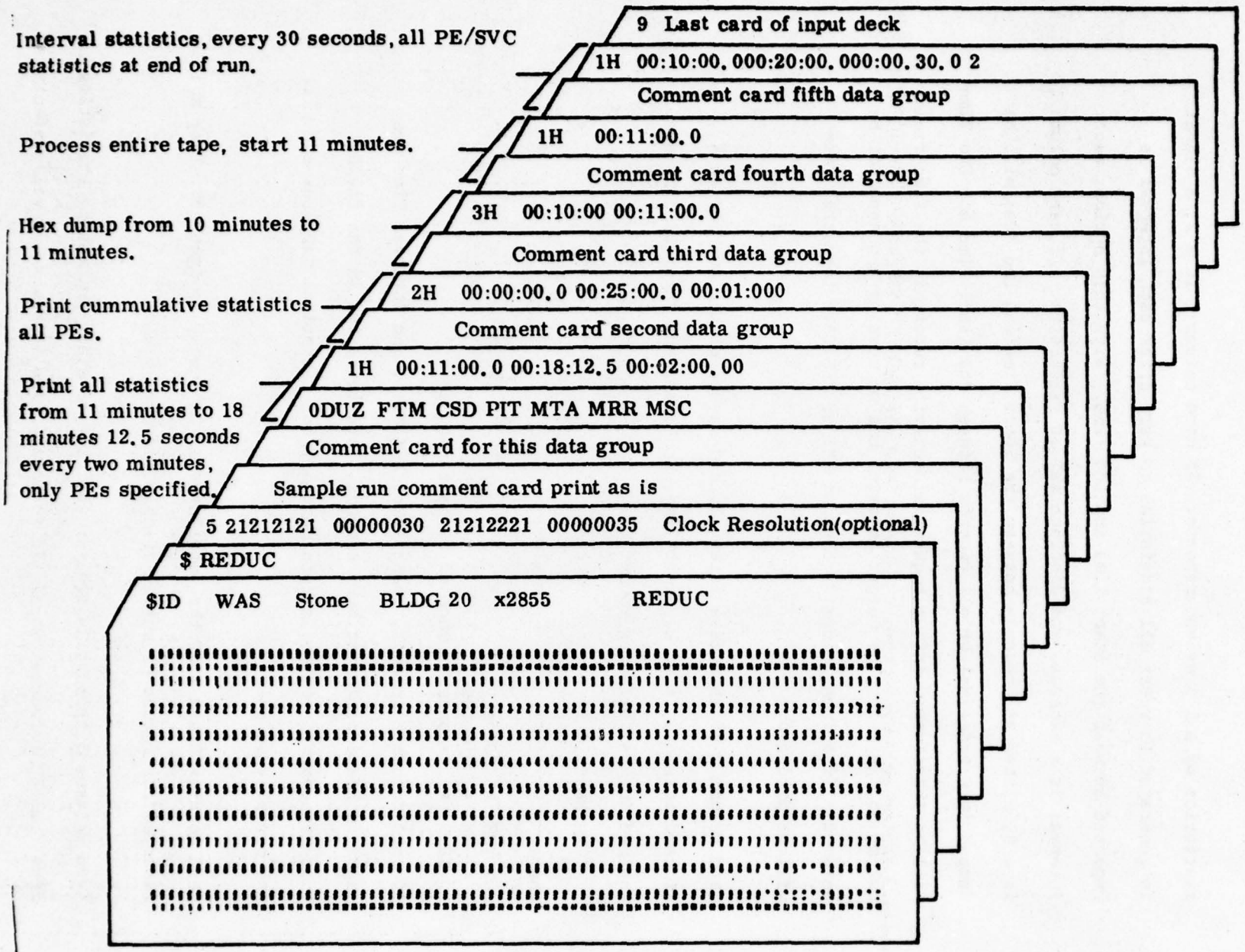



FIGURE 4-2. SAMPLE OF CARDS FOR DETAIL RUN

statistics of all previous reports. If card column 1 is a 2, a signal is generated to reset all statistics to zero after each interval is reported between the Start Time and End Time. With this option, each interval is a separate and distinct set of statistics. If card column 1 is a 3, either all records between the Start Time and End Time will be dumped in Hexadecimal or all records between the Start Time and End Time will be transformed into a sequential activity report if the flag field, column 35, is a 1. The output interval has no meaning and need not be entered. If column 1 is a 7, then an SMI or TESTDATA formatted tape will be produced.

Card column 2 of this data interval card may be either an H or an X. If card column 2 is an H, Start Time, End Time, and Interval Time are entered in the following format:

```
HH:MM:SS.S
```

where

```
  HH  =  Hours
  MM  =  Minutes
SS.S  =  Seconds, truncated to half seconds
```

If card column 2 is an X, Start Time, End Time, and Interval Time are input in Hexadecimal, in half seconds, left-justified in the field. This Hexadecimal option is retained only for historical purposes and will not normally be used.

Card columns 3 and 4 of the Data Interval Card will be ignored. They are reserved for future expansion of this program.

Card columns 5 through 14 are for the time to start processing statistics from the HRT formatted tape. If the start time is blank, it will default

to zero. Start time should be the start of the interval of interest. The start time specified must be on the HRT formatted tape. Card columns 15 through 24 are for the time to end processing from the HRT formatted tape. If the end time is blank, it will default to the end of the HRT tape. This should normally be entered as the end of the interval about which information is desired. Card columns 25 through 34 are for the interval time between successive outputs of the statistics. This interval should be large enough that the results will be statistically significant. If the interval time is blank or equal to zero, it will default to one minute. Card column 35 is used to control the printing of the SVCs used by each PE (PE/SVC) for type 1 or type 2 cards. If card column 35 is a zero or blank, PE/SVC statistics are printed for all PEs each time a print interval is reached. If card column 35 is a 1, PE/SVC statistics are printed only for the total of all SVCs used by every PE; the SVCs used by individual PEs will not be printed. If card column 35 is a 2, PE/SVC statistics are printed for the total SVCs by all PEs every print interval, and at the last interval all PEs will have their own SVC printed separately.

For type 3 cards, the interval time presented in columns 25 through 34 is ignored. All records from the START time to the END time will be presented as one report for a type 3 card.

Column 35 on a type 3 card controls the type of output. If this column is a zero or a blank, the records including the START to the END times will be reported as a Hexadecimal tape dump. If column 35 is anything but a zero or a blank, the records including the START to the END time will be reported as a sequential activity report.

Card column 35 is not used for a type 4 priority two response time report request.

The above cards are necessary for all computer reduction runs. The Data Interval Card will always be the last card input for each period. If multiple periods are desired within the run, each additional period after the first requires only its Data Interval Card.

### 4.1.3 Program Element Flag Card

The Program Element Flag card is for signalling the reduction program to print only detailed statistics for those PEs whose names are entered. If this card is not entered, detailed statistics will be printed for all PEs each time detailed statistics are requested. These details are the SVCs used by each PE. If card column 35 of the Data Interval Card is a 1, this card will be ignored. If card column 35 is a 2, the card will be used only for the last interval to be printed.

This card is identified by having a 0 in card column 1. The SVCs used by each PE will be printed only for those PEs whose names are entered. The PE names may be entered in any order but must be right-justified and end in a card column divisible by 4; i.e., cc 4, 8,...80. This will allow a maximum of 20 PEs to have their SVCs printed in detail. If the SVCs are needed for more than 20 PEs, this card should not be used, and all PE/SVC statistics will then be printed.

The Program Element Flag card is also used to limit the sequential activity report to logical records for specified PEs. When this card is used, the reported delta times will be the time from where HRT gave up control

to the CE for one reported record to where HRT regained control from the same CE for the next reported record. Only records for certain PEs are reported; therefore, there will be records which are not considered in this time, and the HRT overhead required to create those records will be included in the DELTA. In this circumstance, the DELTA cannot be considered the time which would have occurred in HRT's absence. To obtain the DELTA that would have occurred in HRT's absence, the user is presented HRT's overhead for SKIPped records. This time could be deducted from the DELTA to produce that DELTA desired.

### 4.1.4 TARCODE Filter Cards

As a further limitation on the sequential activity report, the user can specify the type of interrupt codes (TARs) he would like reported. When the user specifies a TAR filter, REDUC will report only those interrupt records which contain the requested interrupt code in the second halfword of the HRT entry.

This card is identified by having a 0 in card column 1 with the characters "TARCODE" in card columns 2 through 8. Card columns 9 through 80 are available for as many interrupt codes as the user wishes to place on the card. A user may specify up to 100 TAR codes with these cards and use as many cards as desired in his specification.

The interrupt codes may be specified as described in the CFC Monitor Handbook for TAR ACTION and CONDITION. Each code will occupy four consecutive columns of the card with the first column being the action code and the next three columns being the condition code. A special case for condition code, not described in the CFC Monitor Handbook, is available

so that a user can request all conditions possible for a single action code, which is "FFF". To request all possible external interrupts, for example, a user would specify 1FFF on his TARCODE input. The TAR ACTION codes available are:

| | |
|---|---|
| 1 | External interrupts |
| 2 | SVC interrupts |
| 4 | I/O interrupt other than channel end or device end |
| 5 | I/O interrupt - device end |
| 6 | I/O interrupt - channel end |
| 7 | I/O interrupt - device end with channel end |
| 8 | SIO issued by NAS |
| 9 | Dispatcher |
| B000 | Idle |
| B001 | Suspend |
| D | User defined hook interrupt |

Type 0 PE Filter cards and type 0 TARCODE Filter cards can be used in combinations to limit sequential activity. The effect of using them in combination has a logical operator result. Any TARCODE specified will become an "OR" filter with any filters which follow that TARCODE. Any PE specified will become an "OR" filter with any other PE specified. Any PE specified will become an "AND" filter with all TARCODE filters which follow any PEs. When REDUC limits a sequential activity report, it will do so by these logical operators.

Any interrupt will be reported when filtering is in use only if it is a match on a PE name not used "AND" to a TARCODE or if it is a match both on the PE name "AND" the TARCODE specified together or if it is a match on a TARCODE not used "AND" to a PE name. In the example from Section 5, the request was for all external interrupts or all MRR entries that are dispatcher TARs.

It will be noted in the example that the record for the cell 80 interrupt on the master CE is always presented. This record has a double asterisk to its left and the new time of day as HH:MM:SS.S in its time column.

### 4.1.5 Special Hook Label Cards

If special user-defined hooks were entered to HOOKINIT, a count of the number of times each special hook was encountered will be printed by the reduction program. If the user desires, he may input an identifying label for each special hook. These identifying comments may be entered one per card with card column 1 containing a 6 and card columns 2 and 3 containing the hook ID. The rest of the card may contain any legal EBCDIC characters and will be printed on the output after the count of the number of times the hook was encountered. Such hook label cards must follow the second general comment card and come before the Data Interval card. The Hook Label cards may be in any order since the program will sort on hook ID number.

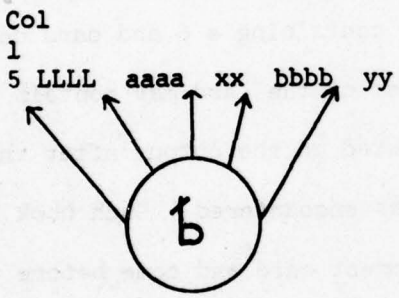
In summary, two comment cards and Data Interval card must be entered for all runs. If different intervals of the same tape are processed at the same time, periods can be stacked. If periods are stacked, the first comment card is used for all periods. The second and subsequent periods must have only a single comment card and its Data Interval card. Hook Label cards will be carried to all periods of the series of periods.

### 4.1.6 Couplet Definition Cards

The user will invoke the REDUC option for HOOK Couplet subroutine definitions for any data interval report by entering a COUPLET DEFINITION card prior to entering the Data Interval card. These Couplet Definition cards

will result in reports being produced which will treat a couplet of user-defined HRT hooks as the begin and end points of a "SUB-PE", and produce PE-like statistics for the couplet.

This card is identified by a 5 in card column 1. The user must include a type 5 Couplet Definition card for each SUB-PE he wants reported. The format of the type 5 definition card is:




where

5 is in card column 1 and is followed by five fields, each field delimited by one or more blanks but containing no embedded blanks

LLLL is a one to eight character SUB-PE label/name

aaaa is a one or more character comment field for the starting point HOOK

xx is the ID number (20-FF) for the initial HOOK point of the sub PE

bbbb is a one or more character comment field for the ending point of the sub PE

yy is the ID number (20-FF) for the exit HOOK point of the sub PE or is the word TERMSV if the sub PE is a subroutine which always ends with an SVC TERMSV

Error messages may be issued by REDUC while processing the definition cards. If the rules for the card format are violated, REDUC will print:

*****INVALID FORMAT FOR INPUT - REQUEST IGNORED

If REDUC runs out of core storage while processing definition cards, it will print:

*****INSUFFICIENT CORE TO DEFINE SUBROUTINES - REQUEST IGNORED

These messages follow those cards which are ignored.

### 4.1.7 SMI/TESTDATA Cards

The REDUC option to write an SMI or TESTDATA formatted tape is invoked using the type 7 control card. The format of the time fields on this card is identical to the type 2 and 3 control cards. Although the interval for writing data to the SMI or TESTDATA tape may be specified, the default time of 5 seconds will be used if this field is left blank. This default interval corresponds to the current requirements of the SMI and TESTDATA reduction program decks. This SMI or TESTDATA tape interval should not be changed unless a corresponding change is made to the respective tape reduction program input deck.

Column 35 of this control card determines which output tape will be created; a blank for the TESTDATA tape, or a 1 for the SMI tape.

### 4.1.8 End of Data Card

The final card entered will be the End of Data card. If this card is not entered, the HRT tape will not be removed and unloaded; and the system will abort. The purpose of this card is to make a normal termination. The format of this card is a 9 in card column 1. The rest of the card may contain any EBCDIC characters, since it will be ignored.

## 4.2 Tape Inputs

The HRT tape input is created by the TARP from TAR data. It has OS standard labels and three different types of data:

1. An 80 byte header record (block) immediately after the OS standard label.
2. Following the 80 byte header record is one block containing a PE name and a SVC name table.
3. The remainder of the tape consists of HRT data blocks, each 10056 (decimal) bytes long.

The first seven doublewords of each HRT data block record are used for header information. The format of this header is as follows:

a. First Doubleword. First halfword contains total record length. Second halfword contains total record length minus four. Second full word contains time in half seconds.

b. Second Doubleword. Not used by REDUC.

c. Third Doubleword. First full word contains buffer number; i.e., record number. Second full word contains HRT clock resolution.

d. Fourth Doubleword. First full word contains HRT clock adjustment. Second full word is not used by REDUC.

e. Fifth Doubleword. Not used by REDUC.

f. Sixth Doubleword. Not used by REDUC.

g. Seventh Doubleword. Not used by REDUC.

Some of these items which are not used by REDUC are used by HRT, and should not all be considered available without a study of HRT.

Figure 4-3 is a sample record the HRT tape.

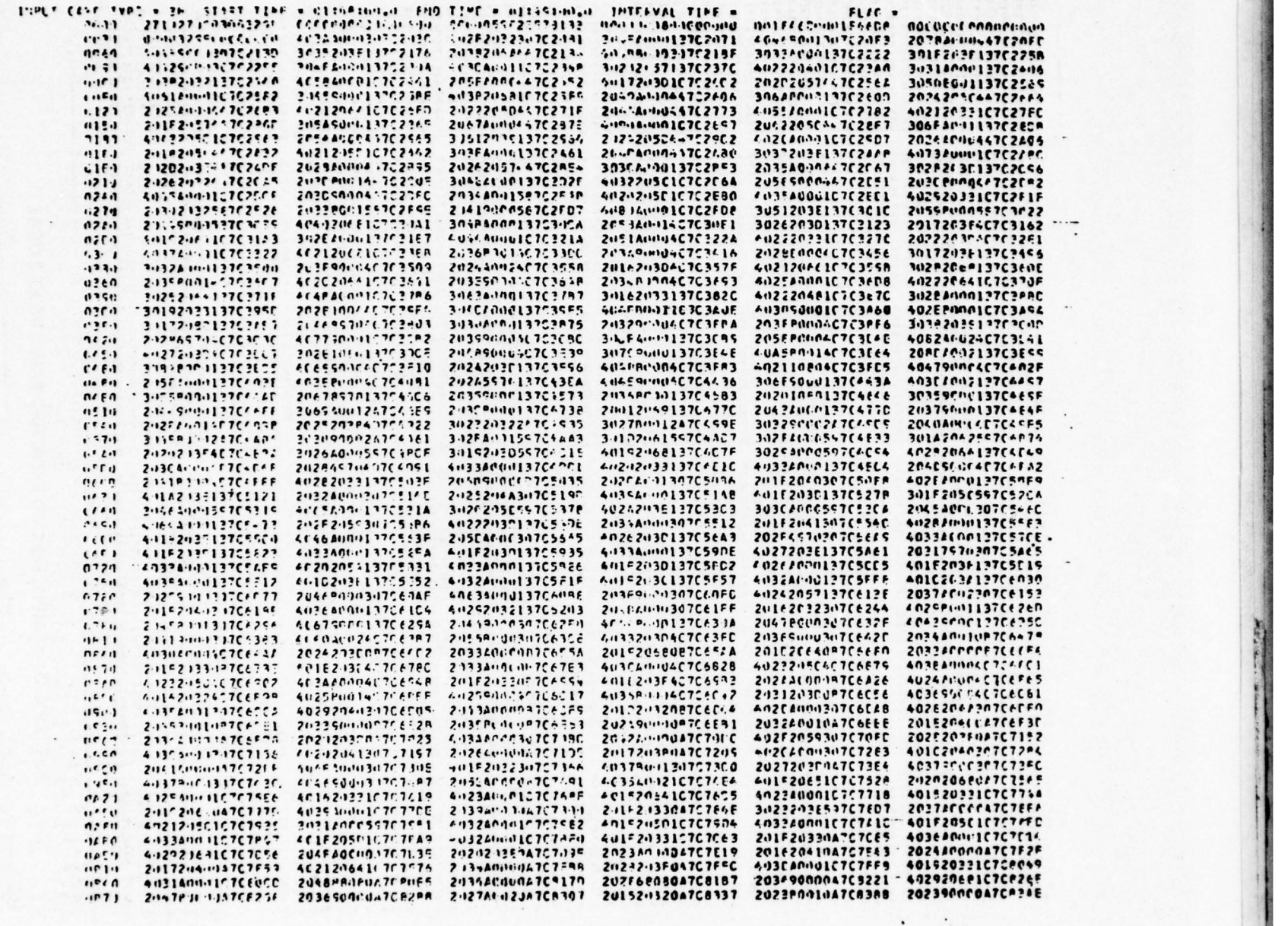


FIGURE 4–3. SAMPLE RECORD FROM HRT TAPE (SHEET 1 OF 4)

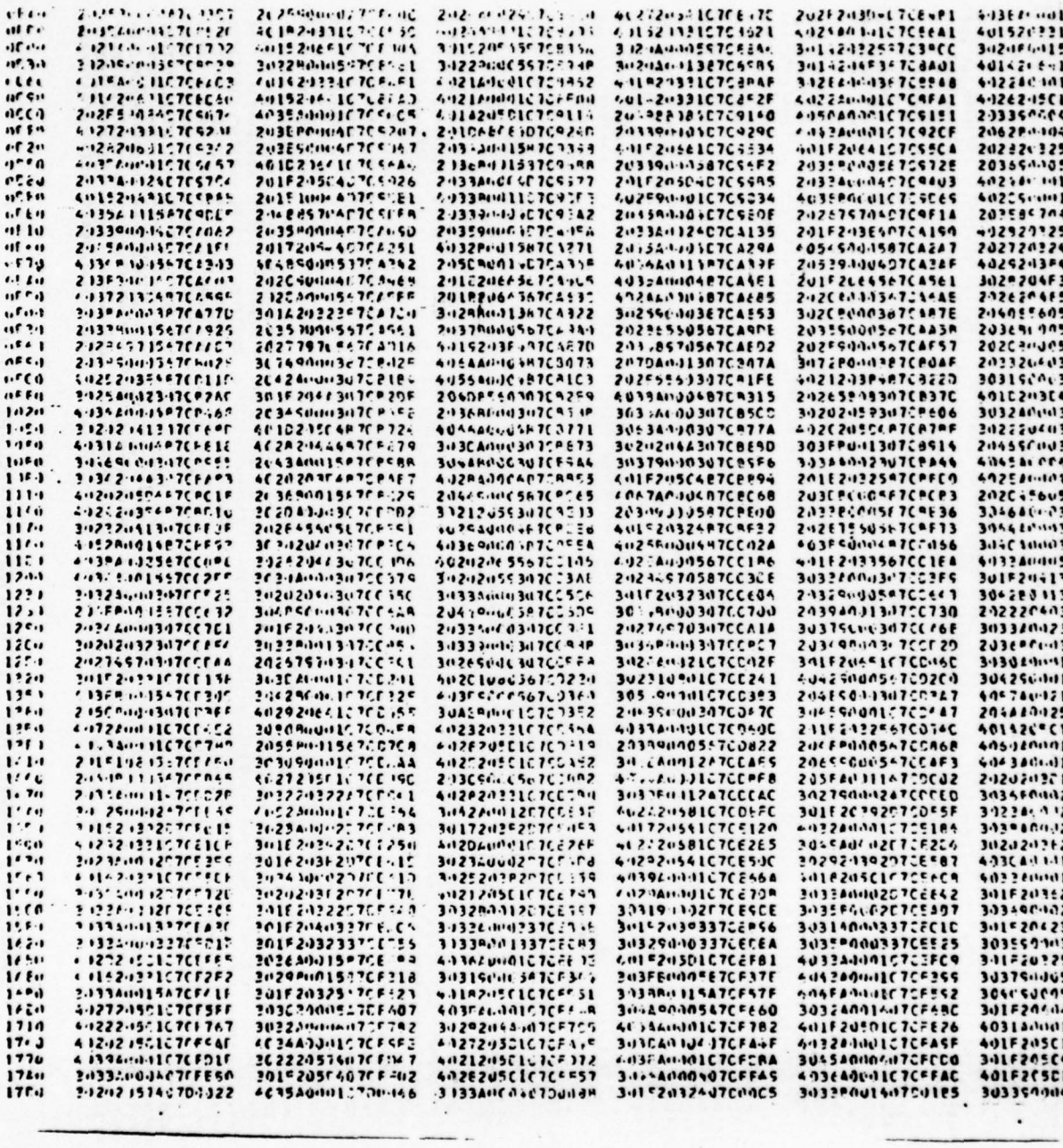


FIGURE 4–3. SAMPLE RECORD FROM HRT TAPE (SHEET 2 OF 4)

FIGURE 4-3. SAMPLE RECORD FROM HRT TAPE (SHEET 3 OF 4)

FIGURE 4–3. SAMPLE RECORD FROM HRT TAPE (SHEET 4 OF 4)

The data on the HRT tape follow the seven doublewords of the header. Each doubleword after the header constitutes a separate data item. The format of each doubleword is as follows:

a. The first half byte will contain the number of the CE which had the interrupt.

b. The second half byte of the first byte together with the second full byte contains the HRT overhead.

c. The third and fourth bytes contain the interrupt code.

d. The first byte of the second full word contains the PE that was last executed or that was executing at the time of this interrupt.

e. The final three bytes contain the high resolution clock value at the moment of the interrupt.

Figure 4-4 illustrates the format of each doubleword.

Each record has the same format and the same header information. This is necessary since reduction of statistics from this tape can be started at any point in time.

The time to start reducing statistics need not be at the start of an HRT record and, in general, will not be at the start of such a record. The reduction will start at the first data item following the timer interrupt which signals the start of the interval to be reduced. This timer interrupt will not normally be the first data item on an HRT tape. Also, reduction can stop at any data item within the HRT record. Reduction stops as soon as the cell 80 timer interrupt signals the end of the interval to be reduced. When the next dump option is selected, only

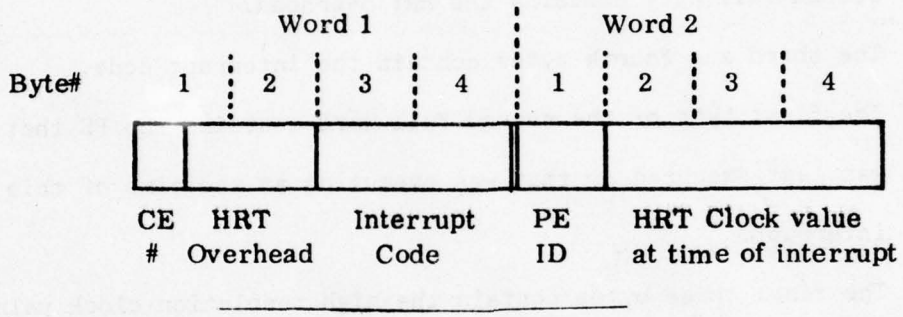



FIGURE 4-4. DOUBLEWORD FORMAT

entire records for the HRT tape will be dumped. This will include the record containing start time of the dump and the record containing the end time of the dump. Reduction can start with any record.

## SECTION 5 - OUTPUTS

The program outputs are the final reports desired by the user. There are basically six reports which are produced at every point interval. These reports will be called PE statistics summary, CE statistics, PE/SVC statistics, special hook count report, external interrupt report, and the sequential activity report. Each report will be discussed separately.

Output reports can be either for the entire period, start to end; or they can have each interval printed separately. Each separate report has the two input comment cards printed at the top. These comment cards should be used to identify the output for future reference. Each of these reports will start on a separate output page.

### 5.1 PE Statistics Summary

The first item printed will be the start and end times for the interval being printed. This report will print a list of all PEs which were executed during the print interval. This list includes both the PE's adapted name and its number. The time used to execute the PE and the time used for SVCs will be printed separately for each PE. Figure 5-1 is a sample of the PE Statistics Summary Report.

The first item printed is the PE number; then its name. The number of times the PE was executed and the number of partial executions will be printed after the name. A partial execution is generated if the PE is already executing when the interval starts, or if the PE has not completed execution at the end of the interval; therefore, a maximum of two partials are possible.

5332V/3301 0123A/CDC 50% LOAD 12/12/72 DEVICES CALINE

MRT 1RPF C324

INTERVAL PROCESSING STATISTICS SUMMARY FROM 01:35:00.0 TO 01:40:00.0

PROGRAM ELEMENT STATISTICS ..... SVC STATISTICS

| PROGRAM ELEMENT | NO. OF EXEC | PART | MEAN | SIG | ACCURACY OF MEAN | PERCENT OF 1 CE | ACA SUSPT OF 1 CE | SUSPENSE OF 1 CE | TOTAL 2 OF 1 CE | TOTAL PERCE OF 1 C |
|---|---|---|---|---|---|---|---|---|---|---|
| 01 RTM | 50 | 0 | 129.243 | 82.670 | 17.54 | 2.281 | 1.142 | .031 | 1.174 | 2.455 |
| 02 RRS | 5 | 1 | 7.230 | 1.355 | 12.79 | .012 | .103 | .018 | .122 | .135 |
| 35 CRN | 174 | 0 | 7.791 | 5.782 | 11.02 | .478 | .812 | .067 | .880 | 1.355 |
| 36 CMA | 117 | 0 | 10.875 | 15.487 | 25.80 | .445 | .496 | .025 | .516 | .945 |
| 37 CIP | 38 | 1 | 7.501 | 1.956 | 9.29 | .100 | .221 | .000 | .221 | .321 |
| 08 CHV | 7 | 1 | 26.977 | 3.018 | 8.81 | .067 | .108 | .000 | .108 | .171 |
| 0E CTY | 1 | 1 | 6.388 | .000 | .00 | .012 | .106 | .000 | .106 | .118 |
| 3A CSS | 174 | 1 | 14.379 | 5.784 | 5.96 | .882 | 1.652 | .150 | 1.842 | 2.726 |
| 0B CCR | 227 | 0 | 25.558 | 17.751 | 7.69 | 2.404 | .556 | .028 | .584 | 2.988 |
| 0C CPL | 114 | 1 | 38.853 | 11.552 | 5.43 | 1.566 | 1.626 | .095 | 1.722 | 3.288 |
| 0D CRR | 43 | 0 | 42.242 | 31.752 | 22.49 | .641 | .577 | .018 | .596 | 1.237 |
| 0E CSS | 169 | 1 | 123.644 | 175.620 | 21.93 | 7.375 | 2.360 | .130 | 2.491 | 5.871 |
| 3F CRO | 110 | 0 | 10.341 | 3.159 | 5.70 | .401 | .363 | .003 | .367 | .769 |
| 10 CSO | 63 | 0 | 20.811 | 10.202 | 12.22 | .458 | .276 | .000 | .276 | .734 |
| 11 IDR | 77 | 0 | 3.111 | 6.100 | 43.80 | .384 | .071 | .300 | .371 | .756 |
| 12 IOU | 11 | 1 | 21.894 | 8.728 | 23.55 | .085 | .160 | .002 | .162 | .247 |
| 13 DBM | 123 | 0 | 87.873 | 33.142 | 10.68 | 3.816 | 2.143 | .169 | 2.313 | 6.130 |
| 14 RRT | 50 | 0 | 244.654 | 31.255 | 3.42 | 4.220 | .088 | .004 | .092 | 4.412 |
| 15 DRS | 1 | 1 | 17.137 | 4.269 | 28.05 | .018 | .040 | .005 | .050 | .068 |
| 16 DDM | 22 | 1 | 53.663 | 33.131 | 25.79 | .416 | .339 | .006 | .346 | .762 |
| 17 DSR | 45 | 1 | 61.875 | 22.124 | 10.39 | .983 | 1.325 | .038 | 1.363 | 2.346 |
| 18 DRV | 6 | 1 | 35.182 | 6.826 | 15.52 | .074 | .119 | .014 | .133 | .208 |
| 1A DDR | 23 | 1 | 43.151 | 28.018 | 22.13 | .533 | .429 | .023 | .452 | .985 |
| 1C DLZ | 63 | 0 | 724.095 | 797.513 | 26.85 | 16.108 | 11.291 | .058 | 11.350 | 27.458 |
| 1D RRS | 31 | 0 | 12.255 | 1.429 | 4.10 | .134 | .163 | .005 | .168 | .303 |
| 1E RRS | 17 | 1 | 11.474 | 1.559 | 8.29 | .068 | .123 | .000 | .123 | .192 |
| 1F RCE | 114 | 0 | 12.607 | 7.262 | 10.57 | .507 | .737 | .010 | .748 | 1.255 |
| 21 RSO | 1 | 1 | 14.531 | .000 | .00 | .005 | .005 | .000 | .005 | .010 |
| 22 RIT | 19 | 1 | 22.289 | 14.343 | 31.80 | .136 | .182 | .000 | .182 | .318 |
| 23 RAA | 71 | 0 | 15.487 | 7.654 | 11.49 | .388 | .390 | .014 | .404 | .793 |
| 24 RCR | 1 | 1 | 44.643 | .000 | .01 | .015 | .016 | .000 | .016 | .032 |
| 25 RTY | 1 | 1 | 43.080 | .000 | .00 | .015 | .009 | .000 | .009 | .024 |
| 26 RTO | 5 | 0 | .826 | .353 | 37.50 | .001 | .005 | .000 | .005 | .006 |
| 27 MSO | 26 | 0 | 1.046 | .358 | 13.17 | .005 | .070 | .000 | .070 | .080 |
| 28 MSC | 28 | 0 | 5.537 | 6.444 | 25.02 | .094 | .138 | .000 | .138 | .232 |
| 29 MDR | 112 | 0 | 1.412 | .215 | 2.82 | .055 | .214 | .000 | .214 | .269 |
| 2A MTA | 600 | 0 | 5.942 | .684 | .92 | 1.258 | .157 | .000 | .157 | 1.416 |
| 2B MRR | 10 | 0 | 47.454 | 4.814 | 6.28 | .167 | .258 | .166 | .424 | .592 |
| 2D TSS | 198 | 0 | 4.097 | 2.274 | 7.75 | .285 | .769 | .000 | .769 | 1.055 |
| 30 MCR | 1738 | 1 | .588 | 2.245 | 17.95 | .361 | 10.252 | .030 | 10.282 | 10.644 |
| 31 CRZ | 1 | 1 | 4.049 | .000 | .00 | .001 | .005 | .000 | .005 | .006 |
| 33 MDC | 217 | 0 | .369 | .278 | 2.92 | .028 | .459 | .030 | .489 | .488 |
| 38 RCA | 700 | 0 | 82.656 | 14.812 | 2.02 | 8.755 | .714 | .000 | .714 | 5.470 |
| 3C CCR | 75 | 0 | 5.680 | 1.511 | 6.02 | .150 | .326 | .000 | .326 | .477 |
| 3F CTU | 50 | 1 | 11.885 | 2.353 | 4.78 | .209 | .532 | .009 | .542 | .752 |
| 40 RCE | 193 | 0 | 10.113 | 2.193 | 3.05 | .685 | .956 | .010 | 1.007 | 1.656 |
| 41 JHC | 3 | 1 | 16.914 | 3.016 | 20.10 | .017 | .053 | .001 | .054 | .072 |
| 42 JCR | 1 | 1 | 5.214 | .000 | .00 | .003 | .008 | .000 | .008 | .011 |
| 44 JCA | 149 | 0 | 14.752 | 15.648 | 17.03 | .776 | 1.730 | .154 | 1.884 | 2.661 |
| 45 JCR | 6 | 1 | 10.474 | 1.399 | 10.66 | .022 | .075 | .000 | .075 | .097 |
| 46 JCR | 1 | 1 | 16.436 | .000 | .00 | .005 | .010 | .000 | .010 | .016 |
| 47 JCT | 3 | 1 | 24.986 | .222 | 1.00 | .026 | .056 | .000 | .056 | .082 |

FIGURE 5–1. PE STATISTICS SUMMARY REPORT (SHEET 1 OF 2)

INPUT CARD TYPE = 2H START TIME = 01:35:00.0 END TIME = 02:20:00.0 INTERVAL TIME = 00:05:00.0 FLAG = 0

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 4B JTA | 9 | 1 | 13.956 | 2.918 | 14.60 | .041 | .059 | .000 | .059 | .101 |
| 4C JTI | 5 | 1 | 22.094 | 2.244 | 8.90 | .039 | .044 | .005 | .054 | .093 |
| 4D HCI | 84 | 1 | 30.762 | 28.343 | 19.59 | .513 | 1.109 | .143 | 1.253 | 2.166 |
| 4E HTI | 213 | 2 | 181.434 | 308.297 | 22.92 | 13.585 | 3.292 | .631 | 4.024 | 17.609 |
| 4F HEV | 283 | 0 | 56.591 | 7.889 | 1.62 | 5.655 | .928 | .170 | 1.099 | 6.754 |
| 4G CRJ | 326 | 0 | 10.477 | 7.019 | 7.27 | 1.206 | 1.174 | .004 | 1.178 | 2.384 |
| 4H CRC | 129 | 1 | 17.140 | 19.789 | 19.84 | .780 | .418 | .230 | .649 | 1.429 |
| 5B RPA | 23 | 1 | 538.916 | 34.941 | 2.64 | 4.376 | .120 | .000 | .120 | 4.497 |
| 5C RSC | 23 | 1 | 56.669 | 7.396 | 5.33 | .460 | .120 | .000 | .120 | .580 |
| 5D RSI | 1044 | 0 | 5.777 | 3.774 | 3.96 | 2.129 | .270 | .000 | .270 | 2.400 |
| 5E RTG | 300 | 0 | 143.447 | 43.381 | 3.42 | 15.195 | .574 | .006 | .580 | 15.776 |
| 5A RST | 283 | 1 | 6.165 | 4.519 | 8.58 | .609 | .072 | .000 | .072 | .682 |
| | | | | | TOTALS | 102.690 | 53.399 | 2.521 | 55.941 | 158.663 |

I/O INTERRUPTS PROCESSED 5753 PERCENT OF 1 CE 14.945

EXTERNAL INTERRUPTS PROCESSED 3538 PERCENT OF 1 CE 3.494

DISPATCHER INTERRUPTS PROCESSED 16012 PERCENT OF 1 CE 2.139

SYSTEM TOTAL 179.241

FIGURE 5–1. PE STATISTICS SUMMARY REPORT (SHEET 2 OF 2)

Mean refers to the mean time of execution for the PE. Sig refers to the standard deviation of execution time from the mean. The accuracy of the mean is in percentage and is a statistical measure of how 90% of the executions differs from the mean. Percentage of one CE is the total percentage of one CE this PE would have used if it had been executed only in one CE.

The SVC statistics give the percentage of one CE used by each PE for SVCs. SVC statistics are broken down into non-suspended and suspended SVCs. There are two totals printed for each PE.

The first is the total percentage of one CE used for SVCs. The second total includes the first total plus the total percentage of one CE used for execution of the PE itself.

The above items are listed for all PEs that were executed during the output interval. If a PE is not listed, that PE was not executed during the interval. After all PEs are listed, a total is taken for each percentage of CE utilization. The total will not necessarily add across to get the total utilization because these items are computed separately and rounded after each computation.

Following the total percentage of PE executions will be the percentage of time used for interrupts and time spent in the dispatcher. First comes the number of I/O interrupts and the percentage of time used for I/O interrupts. Input/Output is performed by the IOCE and all the CE does is signal the start I/O command. The next output is the number of external

interrupts and the time used for external interrupt processing. External interrupts reduced by this program come from primarily two sources: the cell 80 timer, and write directs. Next will be the number of passes through the dispatcher and the percentage of time spent in the dispatcher, followed by the percentage of time spent idle and the percentage of time spent in HRT. Finally will be the total percentage of time for all functions of CFC. This total will be the total time available for computation.

## 5.2 CE Statistics

A separate set of statistics is printed for each CE used by CFC. Figure 5-2 is a sample of the CE statistics report. Outputs will be listed in this order; the percentage of time used for PE computation, the percentage of time used for non-suspended SVCs, the percentage of time used for suspended SVCs, the number of I/O interrupts, the percentage of time used for I/O interrupts, the number of external interval interrupts, the percentage of time used for external interrupts, the number of PEs dispatched, the percentage of time spent in the dispatcher, and the percentage of time spent idle. Finally, there is a total percent printed which is the total CE time spent by CFC.

If more than one CE is used, the above items are printed for each CE. A total of each item for all CEs will also be printed. Again, the total percentage will not be the total time available for computation since HRT uses considerable time in its computations.

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HPT TAPE C224

| | CE EXEC PERCENT | MSLS SVC PERCENT | SUS SVC PERCENT | #I/O INTER | I/O INT PERCENT | #EXT INTER | EXT INT PERCENT | # FF DISPT | DISPATCH PERCENT | IDLE PERCENT | HPT OVH PERCENT | TOTAL PERCENT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CE2 | 21.078 | 13.349 | 1.025 | 5168 | 13.372 | 2214 | 2.868 | 6749 | .888 | 28.065 | 20.438 | 100.087 |
| CE3 | 39.769 | 17.009 | .636 | 0 | .000 | 600 | .182 | 4011 | .535 | 25.554 | 17.206 | 99.531 |
| CE4 | 33.719 | 17.308 | .573 | 1 | .000 | 601 | .184 | 3787 | .506 | 25.417 | 17.181 | 99.887 |
| TOTALS | 97.555 | 47.666 | 2.234 | 5168 | 13.372 | 3415 | 3.234 | 14547 | 1.929 | 79.080 | 54.825 | 299.505 |

FIGURE 5–2. CE STATISTICS REPORT

## 5.3 PE/SVC Statistics

The SVCs used by all PEs by CFC during the interval of the statistics will be printed. The first report of this group of reports will be the total SVCs utilized by all PEs as illustrated in Figure 5-3.

If desired, the user may have printed separately the SVCs used by each PE. If it is desired to have the SVCs printed for only a selected number of PEs, this can be done by including a PE flag card with the input.

The first report includes the SVC number and SVC name. For non-suspended SVCs, this report includes: the number of executions of the SVC, the mean time in milliseconds of each execution, the standard deviation from the mean in milliseconds, the accuracy of the mean, and the total percentage of one CE time this SVC used. These items are also printed for the number of times this SVC was suspended. Also, for suspended SVCs, the number of times the SVC was retried will be printed. The final item printed for each SVC will be the percentage of total time used by this SVC for both suspended and non-suspended services.

At the end of each report, a total percentage of the time of one CE used for suspended as well as non-suspended SVCs will be printed. The total of these two items will be the total percentage printed for all SVCs.

The above report can be printed for all PEs whose SVCs are desired. Each page of this output report is of the same format. The first page is always the summary for all SVCs used by all PEs.

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SYSV/3301 2029A/CPC SJR LOAD 12/12/72 DEVICES CALINE

HOT TAPE 0324

SVC STATISTICS SUMMARY FROM 01:40:00.0TC C1:49:0C.C

| SVC/ACCP ID | NON SUSPENDED SERVICE STATISTICS NO. OF EXEC | MEAN | SIG | ACCURACY OF MEAN | PERCENT OF 1 CP | SUSPENDED SERVICE STATISTICS NO. OF EXEC | RETRY | MEAN | SIG | ACCURACY OF MEAN | PERCENT OF 1 CP | TOTAL CPU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 EMIS | 9021 | .944 | .538 | 1.24 | 2.655 | 0 | C | .000 | .000 | .00 | .CCC | 2.655 |
| 33 FRQMSV | 9144 | 1.577 | .477 | .81 | 5.064 | 0 | 0 | .000 | .000 | .CO | .CCC | 5.064 |
| 34 SCHEDL | 733 | .645 | .071 | .82 | .158 | 2 | C | .000 | .000 | .00 | .CCC | .158 |
| 39 RECCRV | 1007 | 1.442 | .218 | .53 | .508 | 2 | 5 | 8.961 | 4.746 | 83.67 | .CC6 | .514 |
| 3A CHANCEL | 192 | .874 | .394 | 5.73 | .058 | 0 | C | .000 | .000 | .00 | .CCC | .058 |
| 3B LEASE | 2774 | 2.178 | .389 | .66 | 2.167 | 0 | C | .000 | .000 | .CC | .CCC | 2.117 |
| 3C RELEAS | 274 | 1.539 | .495 | 3.81 | .147 | C | C | .000 | .000 | .00 | .CCC | .147 |
| 3D LOCK | 7219 | 1.806 | .487 | .75 | 4.967 | 731 | 2118 | 8.268 | 9.319 | 8.17 | 2.114 | 6.881 |
| 3E UNLOCK | 7501 | 1.347 | .492 | .91 | 3.593 | 0 | C | .000 | .000 | .CO | .CCC | 3.593 |
| 3F SEND | 2620 | 3.602 | .708 | .75 | 3.307 | 1 | 1 | 4.728 | .000 | .CC | .CC1 | 3.308 |
| 41 ACCEPT | 4887 | 1.199 | .401 | 1.12 | 1.883 | 1 | 0 | .000 | .000 | .CC | .C0C | 1.883 |
| 41 REJECT | 2329 | 2.418 | .276 | .46 | 1.582 | 0 | 0 | .000 | .000 | .00 | .CCC | 1.582 |
| 42 RELAY | 297 | 3.115 | 1.359 | 5.68 | .226 | 0 | 0 | .000 | .000 | .00 | .C0C | .226 |
| 44 POINT | .911 | .829 | .272 | 1.47 | .264 | 0 | C | .C00 | .000 | .00 | .CCC | .264 |
| 45 SELECT | 567 | 1.270 | .203 | 1.39 | .225 | 0 | C | .000 | .000 | .00 | .000 | .225 |
| 47 CATOL | 2 | 4.499 | 4.048 | 124.71 | .013 | 0 | 0 | .000 | .000 | .00 | .000 | .003 |
| 48 EXCP | 438 | 4.349 | .936 | 2.01 | .447 | C | C | .000 | .000 | .CO | .0CC | .447 |
| 4A LABEL | 7000 | 7.613 | 1.734 | .89 | 7.772 | 45 | 49 | 7.138 | 1.695 | 6.51 | .112 | 7.884 |
| 4C READ | 71 | 4.142 | 3.345 | 29.47 | .142 | 1 | 0 | .711 | .000 | .00 | .CCC | .042 |
| 4E WRITE | 191 | .734 | .734 | 14.18 | .049 | 0 | C | .000 | .000 | .00 | .CC0 | .C49 |
| 4F WAIT | 411 | 4.303 | 1.414 | 2.60 | .921 | 0 | 4 | .000 | .000 | .CO | .000 | .921 |
| 54 TERMIO | 1438 | .592 | .275 | .68 | .298 | 0 | C | .000 | .000 | .CO | .CCC | .298 |
| 55 SETIO | 7 | .983 | .030 | 4.22 | .000 | 0 | C | .000 | .000 | .00 | .CCC | .CCC |
| 56 IRES | 1 | 4.452 | .000 | .00 | .111 | 0 | C | .000 | .000 | .00 | .000 | .001 |
| 57 SPI | 1542 | 1.095 | .938 | 4.26 | .592 | 0 | C | .000 | .000 | .CO | .CCC | .592 |
| 59 RSETC | 7221 | .478 | .050 | .79 | .372 | 0 | C | .000 | .000 | .00 | .CC0 | .372 |
| 5C TSLCK | 3457 | .602 | 4.213 | 22.68 | .771 | 0 | 0 | .000 | .000 | .CO | .CCC | .771 |
| 60 TSTLK | 3457 | .493 | .079 | .51 | .632 | 0 | C | .000 | .000 | .CC | .CCC | .632 |
| 61 CEASE | 300 | .831 | .129 | 1.74 | .087 | 0 | C | .000 | .000 | .00 | .000 | .087 |
| 62 IRSUM | 711 | .665 | .195 | 1.79 | .049 | 0 | C | .000 | .000 | .00 | .CCC | .C49 |
| 64 GETMAIN | 5224 | 1.453 | 2.360 | 4.40 | 2.660 | 0 | 0 | .000 | .000 | .00 | .000 | 2.660 |
| 66 FREEMAIN | 428 | 1.703 | .241 | 1.34 | .255 | 0 | 0 | .000 | .000 | .00 | .000 | .255 |
| 6A ATTACH | 201 | 3.286 | 2.437 | 10.25 | .231 | C | C | .000 | .000 | .00 | .CCC | .231 |
| 6B LINK | 4768 | 3.497 | 1.749 | 1.05 | 5.356 | C | C | .000 | .000 | .00 | .CCC | 5.356 |

NON SUSPENDED SERVICE TOTALS = 047.492 SUSPENDED SERVICE TOTALS = 002.293 TOTALS = 049.885

FIGURE 5–3. PE/SVC STATISTICS REPORT

## 5.4 Special Hook Count Report

If the user has defined special hooks as input to HRT and these hooks were encountered during the execution of NAS, a report will be generated. This report, as illustrated in Figure 5-4, will contain the number of times each hook was encountered, the user-supplied hook ID, and the label that has been entered for the hook. If no label was entered to the reduction program for a given hook, the comment HOOK LABEL WAS NOT INPUTTED will appear. These labels should be used to identify the location and purpose of the hook.

This report will not be produced if there were no special user-defined hooks or if none of these hooks were encountered. If this report is not generated, there is no message telling the reason.

## 5.5 I/O Statistics Report

The active I/O during the period is reported in the I/O Statistics Report. Outputs will be by device number with subtotals by control unit, channel, IOCE, and a grand total for the system. For each device there will be a count of the SIO commands issued to the device, the frequency of these SIO commands per second, the number of channel ends received since the first SIO for that device, the number of device ends since the first SIO, the number of simultaneous channels end with device end received since the first SIO, and the number of other interrupts received since the first SIO. The other type interrupt is normally a Program Control Interrupt (PCI) type interrupt.

```
SPECIAL HOOKS BY HOOK ID FROM    01:31:00.0   TO    01:36:00.0
   121 (20) NUMBER OF TIMES HOOK WAS ENCOUNTERED  20PAM
   211 (21) NUMBER OF TIMES HOOK WAS ENCOUNTERED  21PAP
   211 (22) NUMBER OF TIMES HOOK WAS ENCOUNTERED  22PAT
   211 (23) NUMBER OF TIMES HOOK WAS ENCOUNTERED  23PCD
   211 (24) NUMBER OF TIMES HOOK WAS ENCOUNTERED  24PJJ
   211 (25) NUMBER OF TIMES HOOK WAS ENCOUNTERED  25PPD
   550 (27) NUMBER OF TIMES HOOK WAS ENCOUNTERED  27PTC
   274 (28) NUMBER OF TIMES HOOK WAS ENCOUNTERED  28RAA
  1460 (29) NUMBER OF TIMES HOOK WAS ENCOUNTERED  29RAD
    88 (2A) NUMBER OF TIMES HOOK WAS ENCOUNTERED  2ARAL
    92 (2B) NUMBER OF TIMES HOOK WAS ENCOUNTERED  2BRAM
   109 (2C) NUMBER OF TIMES HOOK WAS ENCOUNTERED  2CRAP
   192 (2D) NUMBER OF TIMES HOOK WAS ENCOUNTERED  2DRCC
 16173 (2E) NUMBER OF TIMES HOOK WAS ENCOUNTERED  2ERDC
   126 (2F) NUMBER OF TIMES HOOK WAS ENCOUNTERED  2FRDP
    16 (30) NUMBER OF TIMES HOOK WAS ENCOUNTERED  30RGS
   211 (31) NUMBER OF TIMES HOOK WAS ENCOUNTERED  31RJJ
    40 (32) NUMBER OF TIMES HOOK WAS ENCOUNTERED  32RKR
 10250 (33) NUMBER OF TIMES HOOK WAS ENCOUNTERED  33RLI
   161 (34) NUMBER OF TIMES HOOK WAS ENCOUNTERED  34RPA
   153 (35) NUMBER OF TIMES HOOK WAS ENCOUNTERED  35RPR
   151 (36) NUMBER OF TIMES HOOK WAS ENCOUNTERED  36RRD
   274 (37) NUMBER OF TIMES HOOK WAS ENCOUNTERED  37RSG
   300 (38) NUMBER OF TIMES HOOK WAS ENCOUNTERED  38RTD
   274 (39) NUMBER OF TIMES HOOK WAS ENCOUNTERED  39SAA
   895 (3A) NUMBER OF TIMES HOOK WAS ENCOUNTERED  3ASAB
   203 (3B) NUMBER OF TIMES HOOK WAS ENCOUNTERED  3BSAC
   899 (3C) NUMBER OF TIMES HOOK WAS ENCOUNTERED  3CSAD
   894 (3E) NUMBER OF TIMES HOOK WAS ENCOUNTERED  3ESAF
     2 (3F) NUMBER OF TIMES HOOK WAS ENCOUNTERED  3FSAG
   274 (40) NUMBER OF TIMES HOOK WAS ENCOUNTERED  40SAH
   899 (42) NUMBER OF TIMES HOOK WAS ENCOUNTERED  42SAK
   195 (45) NUMBER OF TIMES HOOK WAS ENCOUNTERED  45SAN
  3818 (46) NUMBER OF TIMES HOOK WAS ENCOUNTERED  46SBA
  2194 (47) NUMBER OF TIMES HOOK WAS ENCOUNTERED  47SBB
   716 (48) NUMBER OF TIMES HOOK WAS ENCOUNTERED  48SBC
   405 (49) NUMBER OF TIMES HOOK WAS ENCOUNTERED  49SBD
  1036 (4A) NUMBER OF TIMES HOOK WAS ENCOUNTERED  4ASCA
    91 (4B) NUMBER OF TIMES HOOK WAS ENCOUNTERED  4BSCB
    93 (4C) NUMBER OF TIMES HOOK WAS ENCOUNTERED  4CSCD
   213 (4D) NUMBER OF TIMES HOOK WAS ENCOUNTERED  4DSCE
    96 (4E) NUMBER OF TIMES HOOK WAS ENCOUNTERED  4ESCF
   369 (4F) NUMBER OF TIMES HOOK WAS ENCOUNTERED  4FSCG
   220 (50) NUMBER OF TIMES HOOK WAS ENCOUNTERED  50SCH
   212 (51) NUMBER OF TIMES HOOK WAS ENCOUNTERED  51SCJ
    90 (52) NUMBER OF TIMES HOOK WAS ENCOUNTERED  52SCK
   310 (53) NUMBER OF TIMES HOOK WAS ENCOUNTERED  53SCL
   132 (54) NUMBER OF TIMES HOOK WAS ENCOUNTERED  54SCM
   221 (58) NUMBER OF TIMES HOOK WAS ENCOUNTERED  58SCU
   117 (59) NUMBER OF TIMES HOOK WAS ENCOUNTERED  59SCV
   196 (5A) NUMBER OF TIMES HOOK WAS ENCOUNTERED  5ASCX
   148 (5B) NUMBER OF TIMES HOOK WAS ENCOUNTERED  5BSDA
  6222 (5C) NUMBER OF TIMES HOOK WAS ENCOUNTERED  5CSDB
    21 (5D) NUMBER OF TIMES HOOK WAS ENCOUNTERED  5DSDC
   124 (5F) NUMBER OF TIMES HOOK WAS ENCOUNTERED  5FSDE
   440 (61) NUMBER OF TIMES HOOK WAS ENCOUNTERED  61SFR
  2976 (62) NUMBER OF TIMES HOOK WAS ENCOUNTERED  62SHA
   332 (63) NUMBER OF TIMES HOOK WAS ENCOUNTERED  63SHF
 17707 (64) NUMBER OF TIMES HOOK WAS ENCOUNTERED  64SHV
   401 (65) NUMBER OF TIMES HOOK WAS ENCOUNTERED  65SRC
    82 (66) NUMBER OF TIMES HOOK WAS ENCOUNTERED  66SRF
    68 (67) NUMBER OF TIMES HOOK WAS ENCOUNTERED  67SRG
```

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FIGURE 5–4. SPECIAL HOOK COUNT REPORT (SHEET 1 OF 2)

```
    2 (68) NUMBER OF TIMES HOOK WAS ENCOUNTERED  68SRN
  337 (69) NUMBER OF TIMES HOOK WAS ENCOUNTERED  69SRT
 6412 (6A) NUMBER OF TIMES HOOK WAS ENCOUNTERED  6ASTB
  245 (6C) NUMBER OF TIMES HOOK WAS ENCOUNTERBD  6CXCA
  412 (6D) NUMBER OF TIMES HOOK WAS ENCOUNTERED  6DXFP
 9312 (6E) NUMBER OF TIMES HOOK WAS ENCOUNTERED  6EXFS
  264 (6F) NUMBER OF TIMES HOOK WAS ENCOUNTERED  6FXNF
 1378 (70) NUMBER OF TIMES HOOK WAS ENCOUNTERED  70XPP
    1 (71) NUMBER OF TIMES HOOK WAS ENCOUNTERED  71XRF
  483 (72) NUMBER OF TIMES HOOK WAS ENCOUNTERED  72XRP
  183 (73) NUMBER OF TIMES HOOK WAS ENCOUNTERED  73XRU
  293 (74) NUMBER OF TIMES HOOK WAS ENCOUNTERED  74XTN
```

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FIGURE 5–4. SPECIAL HOOK COUNT REPORT (SHEET 2 OF 2)

Program REDUC computes and reports the mean time the device was busy. This is the average of the times from SIO to device end. Program REDUC also reports the standard deviation, the accuracy of the mean and the total percentage of time the device was utilized. See Figure 5-5 for the format of the report.

## 5.6 External Interrupt Report

Each unique external interrupt combination received on a CE will be reported. For each interrupt combination, the three hexadecimal digits will be printed with the ID of the CE which took that type combination, the number of times the combination occurred on the CE during the interval, the frequency of its occurrence, the mean processing time of the interrupt, the standard deviation of the processing times, the accuracy of the reported mean, and the percentage of total utilization taken to process these interrupts. A report of the total of all external interrupts with statistics will also be given. An example is given in Figure 5-6.

## 5.7 Sequential Activity Report

Each logical record in sequence from the HRT records containing the period requested will be printed in hexadecimal and translated. For each logical record printed, the PE ID will be translated to the PE name, the interrupt code will be translated, the HRT overhead will be converted to decimal microseconds and printed, and the delta time in decimal microseconds from the previously reported record on the same CE will be printed. An example is given in Figure 5-7.

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533Y/3381 9020A/CDC 50% LOAD 12/12/72 DEVICES ONLINE

HPT TAPE 0324

INPUT/OUTPUT STATISTICS REPORT FROM 01:40:00.0 TO 01:45:00.0

| DEVICE NUMBER | NO. OF SIO | FREQUENCY SIO/SEC | NO. OF C-END | NO. OF D-END | NO. OF C&D-END | NO. OF OTHERS | MEAN TIME | STANDARD DEVIATION | ACCURACY OF MEAN | TOTAL TIME % UTILIZATION |
|---|---|---|---|---|---|---|---|---|---|---|
| 466 | 50 | 0.1 | 0 | 0 | 49 | 0 | 6071.790 | 6956.925 | 3.208 | 99.893 |
| 467 | 99 | 0.3 | 0 | 0 | 98 | 0 | 223.298 | 104.394 | .925 | 7.748 |
| CONTROL UNIT SUBTOTAL | 149 | 0.5 | 0 | 0 | 147 | 0 | 2172.795 | 4872.501 | 3.625 | 107.641 |
| CHANNEL SUBTOTAL | 149 | 0.5 | 0 | 0 | 147 | 0 | 2172.795 | 4872.501 | 3.625 | 107.641 |
| 523 | 17 | 0.0 | 0 | 0 | 17 | 0 | 19.981 | 4.036 | .960 | .119 |
| CONTROL UNIT SUBTOTAL | 17 | 0.0 | 0 | 0 | 17 | 0 | 19.981 | 4.036 | .960 | .119 |
| 560 | 180 | 0.6 | 67 | 67 | 113 | 157 | 81.283 | 297.040 | 5.338 | 5.126 |
| CONTROL UNIT SUBTOTAL | 180 | 0.6 | 67 | 67 | 113 | 157 | 81.283 | 297.040 | 5.338 | 5.126 |
| CHANNEL SUBTOTAL | 197 | 0.6 | 67 | 67 | 130 | 157 | 75.993 | 284.458 | 5.227 | 5.245 |
| 680 | 1463 | 5.1 | 0 | 0 | 1452 | 21 | 19.474 | 23.076 | .609 | 9.908 |
| CONTROL UNIT SUBTOTAL | 1463 | 5.1 | 0 | 0 | 1452 | 21 | 19.474 | 23.076 | .609 | 9.908 |
| CHANNEL SUBTOTAL | 1463 | 5.1 | 0 | 0 | 1452 | 21 | 19.474 | 23.076 | .609 | 9.908 |
| IOCE 2 SUBTOTAL | 1809 | 6.3 | 67 | 67 | 1729 | 178 | 201.920 | 1516.269 | 3.472 | 122.794 |
| 802 | 8 | 0.0 | 8 | 8 | 0 | 0 | 3224.109 | 2132.196 | 4.582 | 9.037 |
| 808 | 363 | 1.2 | 355 | 363 | 0 | 0 | 87.055 | 25.511 | .301 | 11.072 |
| CONTROL UNIT SUBTOTAL | 371 | 1.2 | 363 | 371 | 0 | 0 | 154.700 | 553.444 | 3.640 | 20.110 |
| 817 | 12 | 0.0 | 0 | 0 | 11 | 0 | 24784.892 | 27151.328 | 6.473 | 99.963 |
| 818 | 6 | 0.0 | 0 | 0 | 5 | 0 | 47584.030 | 41737.680 | 7.688 | 99.975 |
| 819 | 15 | 0.0 | 0 | 0 | 15 | 0 | 173.661 | 30.574 | .890 | .912 |
| 814 | 7 | 0.0 | 0 | 0 | 7 | 0 | 212.140 | 60.823 | 2.123 | .520 |
| CONTROL UNIT SUBTOTAL | 40 | 0.1 | 0 | 0 | 38 | 0 | 13543.259 | 27110.176 | 6.364 | 201.372 |
| 834 | 2 | 0.0 | 0 | 0 | 1 | 0 | 238555.555 | .000 | .000 | 99.983 |
| 830 | 8 | 0.0 | 8 | 8 | 0 | 0 | 998.205 | 927.368 | 6.437 | 2.312 |
| 838 | 4 | 0.0 | 4 | 4 | 0 | 0 | 1534.230 | 1679.287 | 10.726 | 2.150 |
| CONTROL UNIT SUBTOTAL | 14 | 0.0 | 12 | 12 | 1 | 0 | 19436.778 | 63265.648 | 17.694 | 104.445 |
| 850 | 1 | 0.0 | 0 | 0 | 1 | 0 | 3.233 | .000 | .000 | .001 |
| 851 | 1 | 0.0 | 0 | 0 | 1 | 0 | 15026.767 | .000 | .000 | 5.265 |
| 852 | 5 | 0.0 | 0 | 0 | 5 | 0 | 7946.783 | 8619.259 | 9.507 | 12.283 |
| 856 | 455 | 1.5 | 0 | 0 | 455 | 0 | 5.144 | 5.362 | .957 | .820 |
| CONTROL UNIT SUBTOTAL | 462 | 1.6 | 0 | 0 | 462 | 0 | 123.603 | 1400.359 | 10.331 | 18.369 |
| 886 | 19 | 0.0 | 0 | 0 | 18 | 0 | 16146.005 | 20604.432 | 5.895 | 99.950 |
| 887 | 68 | 0.2 | 0 | 0 | 68 | 0 | 148.663 | 27.938 | .446 | 3.542 |

FIGURE 5–5. I/O STATISTICS REPORT (SHEET 1 OF 2)

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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CONTROL UNIT SUBTOTAL | 87 | 0.3 | 0 | 0 | 86 | 0 | 3496.544 | 11454.738 | 6.523 | 103.492 |
| 8F3 | 19 | 0.0 | 0 | 0 | 19 | 0 | 10149.057 | 3238.613 | 1.434 | 65.255 |
| CONTROL UNIT SUBTOTAL | 19 | 0.0 | 0 | 0 | 19 | 0 | 10149.057 | 3238.613 | 1.434 | 65.255 |
| CHANNEL SUBTOTAL | 993 | 3.4 | 375 | 383 | 616 | 0 | 1390.687 | 10326.202 | 4.627 | 513.086 |
| 931 | 14 | 0.0 | 0 | 0 | 14 | 0 | 12.727 | 5.683 | 2.335 | .062 |
| 934 | 106 | 0.3 | 0 | 0 | 106 | 0 | 112.825 | 5.615 | .162 | 4.193 |
| CONTROL UNIT SUBTOTAL | 120 | 0.4 | 0 | 0 | 120 | 0 | 101.150 | 33.439 | .591 | 4.253 |
| 970 | 810 | 2.8 | 298 | 298 | 512 | 535 | 46.554 | 144.166 | 2.114 | 13.326 |
| CONTROL UNIT SUBTOTAL | 810 | 2.8 | 298 | 298 | 512 | 535 | 46.554 | 144.166 | 2.114 | 13.326 |
| CHANNEL SUBTOTAL | 930 | 3.2 | 298 | 298 | 632 | 535 | 53.947 | 136.295 | 1.623 | 17.579 |
| IOCE 3 SUBTOTAL | 1923 | 6.7 | 673 | 681 | 1238 | 535 | 742.866 | 7443.765 | 4.483 | 530.665 |
| SYSTEM TOTAL | 3732 | 13.0 | 746 | 748 | 2967 | 713 | 481.348 | 5459.544 | 3.647 | 653.460 |

FIGURE 5–5. I/O STATISTICS REPORT (SHEET 2 OF 2)

TEST OF REDUC FOR Z.1

INTERVAL HEADER CARD NOT PROVIDED

EXTERNAL INTERRUPT REPORT FROM 01:11:14.5 TO 01:19:45.5

TYPE CODE DEFINITIONS - XX1 = DAA ; XX2 = PIR ; XX4 = WD CE 4 ; X1X = WD CE 3 ; X8X = TIMER ; 1XX = WD CE 2 ; 4XX = WD CE 1

| | TYPE CODE | CE I.D. NUMBER | NUMBER OF TYPE | FREQUENCY INT / SEC | PROCESSING MEAN TIME | STANDARD DEVIATION | ACCURACY OF MEAN | TOTAL TIME % UTILIZATION |
|---|---|---|---|---|---|---|---|---|
| | 004 | 2 | 829 | 1.6 | 4.212 | 3.435 | .555 | .689 |
| | 010 | 2 | 750 | 1.4 | 4.233 | 3.442 | .562 | .626 |
| | 014 | 2 | 15 | .0 | 5.207 | 3.999 | 3.886 | .015 |
| | 080 | 2 | 1002 | 1.9 | 7.022 | 4.262 | .375 | 1.388 |
| | 080 | 3 | 1023 | 2.0 | 1.340 | .732 | .335 | .270 |
| | 080 | 4 | 1022 | 2.0 | 1.342 | .734 | .335 | .270 |
| | 084 | 2 | 12 | .0 | 10.766 | 8.316 | 4.370 | .025 |
| | 090 | 2 | 6 | .0 | 8.501 | 6.392 | 6.017 | .010 |
| | 094 | 2 | 2 | .0 | 10.989 | 9.584 | 12.088 | .004 |
| TOTALS ** | 094 | | 4661 | 9.1 | 3.580 | 1.840 | .147 | 3.301 |

FIGURE 5–6. EXTERNAL INTERRUPT STATISTICS REPORT



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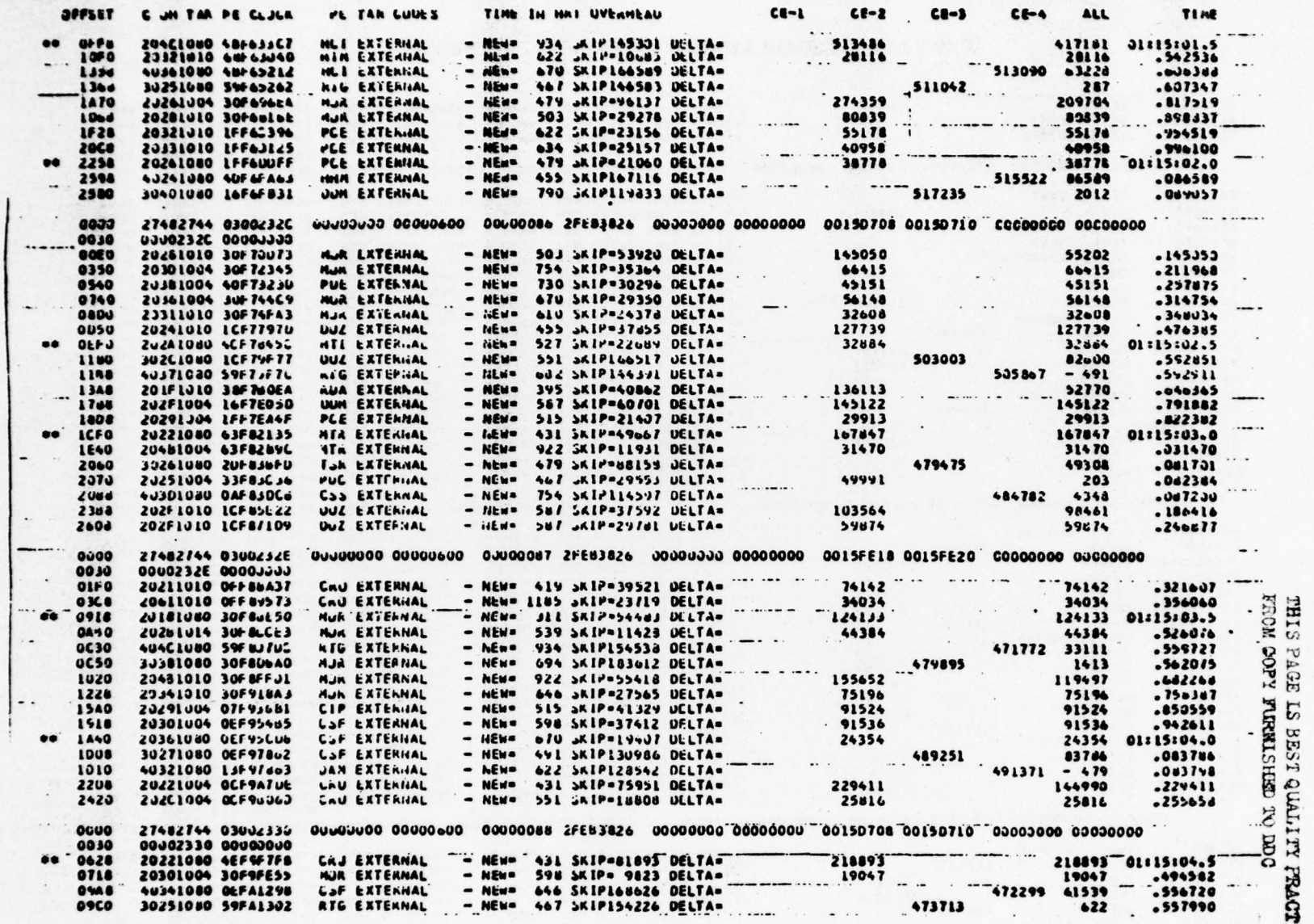
```
QTARCCUE 1FFF                                                    INPUT CONTROL CARD
QMPP                                                             INPUT CONTROL CARD
QTARCUUE 9FFF                                                    INPUT CONTROL CARD
3H  01:15:00.001:16:00.0          1                              INPUT CONTROL CARD

 INPUT CARD TYPE = 3H  START TIME = 01:15:00.0  END TIME = 01:16:00.0  INTERVAL TIME =                    FLAG = 1
    0000   27482744 03002326  00000000 00000600  00000084 2FEB3826  00000000 00000000  0015D708 00150710  00000000 00000000
    0030   00002326 00000000
    0438   20231004 4EF35d91  CRJ EXTERNAL
    0588   20201010 4EF3ed29  CRJ EXTERNAL    - NEW=  563 SKIP=20688 DELTA=        38179                38179
    06C0   20251004 4EF3e651  CRJ EXTERNAL    - NEW=  467 SKIP=21767 DELTA=        91536                91536
**  07F0   20251080 4EF39150  CRJ EXTERNAL    - NEW=  467 SKIP=1977d DELTA=        33639                33639  01:14:59.5
    0938   20241010 4EF39679  CRJ EXTERNAL    - NEW=  455 SKIP=20581 DELTA=        30692                30692
    0970   30241080 59F3B02E  RTG EXTERNAL
    0978   40241080 68F3e045  MTM EXTERNAL
    0A20   20251010 59F3d95F  RTG EXTERNAL    - NEW=  467 SKIP=10817 DELTA=        91237                27457
    0H30   20281004 59F3C4A5  RTG EXTERNAL    - NEW=  539 SKIP=17214 DELTA=        34106                34106
    0C38   20251004 59F3e30E  RTG EXTERNAL    - NEW=  467 SKIP=19850 DELTA=        93872                93872
    0D90   20291010 59F3EF92  RTG EXTERNAL    - NEW=  515 SKIP=21419 DELTA=        36765                36765
    0EL0   20261004 59F46E83  RTG EXTERNAL    - NEW=  591 SKIP=24210 DELTA=        94376                94376
    0FC8   20261004 59F41dC6  RTG EXTERNAL    - NEW=  475 SKIP=16699 DELTA=        30919                30919
**  1CD0   20251080 59F43AA0  RTG EXTERNAL    - NEW=  467 SKIP=20030 DELTA=       103336               103336  01:15:00.0
    1248   20281010 59F4459E  RTG EXTERNAL    - NEW=  539 SKIP=21515 DELTA=        33243                33243  .033243
    1328   20261004 59F45JBE  RTG EXTERNAL    - NEW=  479 SKIP= 6325 DELTA=        33579                33579  .067361
    13F0   30421080 30F45943  MJR EXTERNAL    - NEW=  814 SKIP=63492 DELTA=                518206       25768  .093609
    13F8   40361040 63F45965  MTR EXTERNAL    - NEW=  694 SKIP=66798 DELTA=                        518218  - 527  .093896
    1470   20291010 59F477C0  RTG EXTERNAL    - NEW=  515 SKIP=70209 DELTA=       119305               92555  .187146
    1558   20251010 59F4d27E  RTG EXTERNAL    - NEW=  467 SKIP=16d19 DELTA=        32273                32273  .219935
    1688   20261010 59F49A7A  RTG EXTERNAL    - NEW=  479 SKIP=21299 DELTA=        73471                73471  .293d74
    1850   20201004 59F4AFEC  RTG EXTERNAL    - NEW=  563 SKIP=27146 DELTA=        64906                64906  .359259
**  1AC8   20241080 4AF4E217  JTU EXTERNAL    - NEW=  455 SKIP=33938 DELTA=       153292               153292  01:15:00.5
    1BF0   20241010 56F4EC91  RJU EXTERNAL    - NEW=  455 SKIP=11859 DELTA=        31674                31674  .545244
    1D18   20251010 56F4F7B3  RJJ EXTERNAL    - NEW=  467 SKIP=20437 DELTA=        33686                33686  .579386
    1DE8   40221080 59F5J0FE  RTG EXTERNAL    - NEW=  431 SKIP=48050 DELTA=                513294       28032  .637486
    1UF0   30231080 56F5J126  RJU EXTERNAL    - NEW=  443 SKIP=78550 DELTA=        513941               47     .608365
    20F8   20201004 30F54570  MJR EXTERNAL    - NEW=  563 SKIP=54315 DELTA=       237940               208985  .817794
    21E0   20251004 30F55088  MJR EXTERNAL    - NEW=  467 SKIP=16855 DELTA=        33495                33495  .851852
    22E8   20201004 30F57918  MJR EXTERNAL    - NEW=  563 SKIP=20066 DELTA=       123894               123854  .976214
    2300   20201004 30F5d3B0  MJR EXTERNAL    - NEW=  563 SKIP=16747 DELTA=        31506                31506  1.008283
**  2498   20241080 30F58C32  MJR EXTERNAL    - NEW=  455 SKIP=17634 DELTA=        25948                25949  01:15:01.0

    0000   27482744 03002d2A  00000000 00000600  00000085 2FEB3826  00000000 00000000  0015FE18 0015FE20  00000000 00000000
    0030   00002d2A 00000000
    0080   40241080 1FF5AA9E  PCE EXTERNAL    - NEW=  455 SKIP=73303 DELTA=                        519775  92842  .092842
    00A0   30551080 2DF5A858  TSR EXTERNAL    - NEW= 1042 SKIP=52902 DELTA=                521704       1964   .095262
```

FIGURE 5–7. SEQUENTIAL ACTIVITY REPORT (SHEET 1 OF 3)



```
   OFFSET   C  JH TAA PE CLOCK      PE TAR CODES      TIME IN HRI OVERHEAD          CE-1      CE-2      CE-3      CE-4      ALL       TIME
 ** 0FF8  204C1080 48F633C7  MLI EXTERNAL   - NEW=  934 SKIP=145331 DELTA=          513486                                417181  01:15:01.5
    1000  23321010 4BF63040  MIM EXTERNAL   - NEW=  622 SKIP=10683 DELTA=           28116                                 28116  .542536
    1380  40361080 4BF65212  MLI EXTERNAL   - NEW=  670 SKIP=166589 DELTA=                                513090    63228  .606388
    13C0  30251080 59F63262  MIG EXTERNAL   - NEW=  467 SKIP=146583 DELTA=                     511042                   287  .607347
    1A70  20261004 30F696EA  MJR EXTERNAL   - NEW=  479 SKIP=96137 DELTA=           274359                                209704  .817519
    1080  20281010 30F68B1E  MJR EXTERNAL   - NEW=  503 SKIP=29278 DELTA=           80839                                 80839  .898337
    1F28  20321010 1FF6C396  PCE EXTERNAL   - NEW=  622 SKIP=23156 DELTA=           55178                                 55178  .954519
    20C0  20331010 1FF6D125  PCE EXTERNAL   - NEW=  634 SKIP=25157 DELTA=           40958                                 40958  .996100
 ** 2258  20261080 1FF6DDFF  PCE EXTERNAL   - NEW=  479 SKIP=21060 DELTA=           38778                                 38778  01:15:02.0
    2598  40241080 40F6FA63  MMM EXTERNAL   - NEW=  455 SKIP=167116 DELTA=                                515522   86589  .086589
    2580  30401080 16F6FB31  DUM EXTERNAL   - NEW=  790 SKIP=119833 DELTA=                     517235                2012  .088057

          0000  27482744 0300232C  00000000 00000600  00000086 2FE83826  00000000 00000000  0015D708 0015D710  C0000000 00000000
          0030  0000232C 00000000
          00E0  20261010 30F70073  MJR EXTERNAL   - NEW=  503 SKIP=53920 DELTA=          149050                                 55202  .145353
          0350  20301004 30F72345  MJM EXTERNAL   - NEW=  754 SKIP=35364 DELTA=           66415                                 66415  .211968
          0540  20381004 40F73230  PUE EXTERNAL   - NEW=  730 SKIP=30296 DELTA=           45151                                 45151  .257875
          0740  20361004 30F744C9  MJR EXTERNAL   - NEW=  670 SKIP=29350 DELTA=           56148                                 56148  .314754
          08D0  23311010 30F74FA3  MJM EXTERNAL   - NEW=  610 SKIP=24378 DELTA=           32608                                 32608  .340034
          0D50  20241010 1CF77970  DUZ EXTERNAL   - NEW=  455 SKIP=37655 DELTA=          127739                                127739  .476385
 ** 0EF0  20241080 4CF7D65C  MTI EXTERNAL   - NEW=  527 SKIP=22689 DELTA=           32884                                 32884  01:15:02.5
    1180  302C1080 1CF7AF77  DUZ EXTERNAL   - NEW=  551 SKIP=146517 DELTA=                     503003                   82600  .592851
    1198  40371C80 59F7B77C  MTG EXTERNAL   - NEW=  682 SKIP=144391 DELTA=                                505867  - 491  .592511
    13A8  201F1010 38F7B0EA  MDA EXTERNAL   - NEW=  395 SKIP=40862 DELTA=          136113                                 52770  .640365
    1708  202F1004 16F7E05D  DUM EXTERNAL   - NEW=  567 SKIP=60701 DELTA=          145122                                145122  .791882
    1808  20291J04 1FF7EA4F  PCE EXTERNAL   - NEW=  515 SKIP=21407 DELTA=           29913                                 29913  .822382
 ** 1CF0  20221080 63F82135  MTA EXTERNAL   - NEW=  431 SKIP=49667 DELTA=          167847                                167847  01:15:03.0
    1E40  2048100A 63F82B9C  MTA EXTERNAL   - NEW=  922 SKIP=11931 DELTA=           31470                                 31470  .831470
    2060  30261080 20F83BFD  TSR EXTERNAL   - NEW=  479 SKIP=88159 DELTA=                     479475                   49308  .881701
    2070  20251004 33F83C36  PUC EXTERNAL   - NEW=  467 SKIP=29553 DELTA=           49991                                   203  .882384
    2088  40301080 0AF83DC6  CSS EXTERNAL   - NEW=  754 SKIP=114597 DELTA=                                484782   4348  .887230
    2388  202F1010 1CF85E22  DUZ EXTERNAL   - NEW=  587 SKIP=37592 DELTA=          103564                                 98461  .186416
    2608  202F1010 1CF87109  DUZ EXTERNAL   - NEW=  587 SKIP=29781 DELTA=           59874                                 59874  .246877

          0000  27482744 0300232E  00000000 00000600  00000087 2FE83826  00000000 00000000  0015FE18 0015FE20  C0000000 00000000
          0030  0000232E 00000000
          01F0  20211010 0FF88A37  CRU EXTERNAL   - NEW=  419 SKIP=39521 DELTA=           74142                                 74142  .321607
          03C8  20611010 0FF89573  CRU EXTERNAL   - NEW= 1185 SKIP=23719 DELTA=           34034                                 34034  .356060
 ** 0918  20181080 30F8AE50  MJR EXTERNAL   - NEW=  311 SKIP=54483 DELTA=          124133                                124133  01:15:03.5
    0A40  202B1014 30F8CCE3  MJR EXTERNAL   - NEW=  539 SKIP=11428 DELTA=           44384                                 44384  .526076
    0C30  404C1080 59F8D7DC  MTG EXTERNAL   - NEW=  934 SKIP=154538 DELTA=                                471772   33111  .559727
    0C50  30381080 30F8D6A0  MJR EXTERNAL   - NEW=  694 SKIP=183012 DELTA=                     479895                1413  .562075
    1020  20481010 30F8FFD1  MJM EXTERNAL   - NEW=  922 SKIP=55418 DELTA=          155652                                119497  .682264
    1228  20341010 30F918A3  MJM EXTERNAL   - NEW=  646 SKIP=27565 DELTA=           75196                                 75196  .756367
    15A0  20291004 07F93681  CIP EXTERNAL   - NEW=  515 SKIP=41329 DELTA=           91524                                 91524  .850559
    1518  20301004 0EF954B5  CSF EXTERNAL   - NEW=  598 SKIP=37412 DELTA=           91536                                 91536  .942611
 ** 1A40  20361080 0EF95C06  CSF EXTERNAL   - NEW=  670 SKIP=19407 DELTA=           24354                                 24354  01:15:04.0
    1D08  30271080 0EF97862  CSF EXTERNAL   - NEW=  491 SKIP=130986 DELTA=                    489251                   83786  .083786
    1010  40321080 13F97E03  DAM EXTERNAL   - NEW=  622 SKIP=128542 DELTA=                                491371  - 479  .083748
    2208  20221004 0CF9A7DE  CRU EXTERNAL   - NEW=  431 SKIP=75951 DELTA=          229411                                144990  .224411
    2420  202C1004 0CF9C06D  CRU EXTERNAL   - NEW=  551 SKIP=18808 DELTA=           25816                                 25816  .250654

          0000  27482744 0300233C  00000000 00000600  00000088 2FE83826  00000000 00000000  0015D708 0015D710  00000000 00000000
          0030  0000233C 00000000
 ** 0628  20221080 4EF9F7F8  CRJ EXTERNAL   - NEW=  431 SKIP=81893 DELTA=          218893                                218893  01:15:04.5
    0718  20301004 30F9FE55  MJR EXTERNAL   - NEW=  598 SKIP= 9823 DELTA=           19047                                 19047  .494582
    09A8  40341080 0EFA1298  CSF EXTERNAL   - NEW=  646 SKIP=168626 DELTA=                                472299   41539  .536720
    09C0  30251080 59FA1302  RTG EXTERNAL   - NEW=  467 SKIP=154226 DELTA=                     473713                 622  .537990
```

FIGURE 5–7. SEQUENCIAL ACTIVITY REPORT (SHEET 2 OF 3)

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FROM COPY FURNISHED TO DDC

| | OFFSET | G UN TAR | PB CLOCK | PB TAR CODE | TIME IN NBT OVERHEAD | CB-1 | CB-2 | CB-3 | CB-4 | ALL | TIME |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1060 | 201A10C4 30FA80E7 | MJR EXTERNAL | - NEW= 335 SKIP=99503 DELTA= | | 399834 | | | 336557 | .895013 | |
| ** | 1290 | 20201080 30FA990E | MJR EXTERNAL | - NEW= 407 SKIP=24127 DELTA= | | 76226 | | | 76226 | 01:15:05.0 | |
| | 13E6 | 202F1034 30FA4B58 | MJR EXTERNAL | - NEW= 587 SKIP=10602 DELTA= | | 44025 | | | 44025 | .044025 | |
| | 1598 | 402C1080 1CF A9423 | UUZ EXTERNAL | - NEW= 551 SKIP107649 DELTA= | | | | 494773 | 35543 | .080156 | |
| | 15C0 | 30481080 33FA85GE | PDC EXTERNAL | - NEW= 886 SKIP=85714 DELTA= | | | 497648 | | 3414 | .084121 | |
| ** | 2138 | 201F1080 4FFB2E76 | CBC EXTERNAL | - NEW= 395 SKIP131740 DELTA= | | 410688 | | | 370292 | 01:15:05.5 | |
| | 22C8 | 20201004 59FB3D04 | RTG EXTERNAL | - NEW= 407 SKIP=13644 DELTA= | | 46732 | | | 46732 | .502428 | |
| | 23E8 | 30241080 1CFB49C4 | DUZ EXTERNAL | - NEW= 527 SKIP=27074 DELTA= | | | 454030 | | 36202 | .538038 | |
| | 23F0 | 40361080 59FB49C7 | RTG EXTERNAL | - NEW= 670 SKIP131764 DELTA= | | | | 458367 | - 451 | .539074 | |
| | 0000 | 27482744 03002333 | 00J00000 00000600 | 00000089 2FEB3826 | 00000000 00000000 | 0015FE18 | 0015FE20 | 00000000 | 00000000 | | |
| | 0030 | 00002333 00000000 | | | | | | | | | |
| | 04F8 | 20261004 63FB8B9E | MTR EXTERNAL | - NEW= 479 SKIP=82707 DELTA= | | 385363 | | | 348453 | .888199 | |
| | 05F8 | 20221004 63FBC907 | MTR EXTERNAL | - NEW= 431 SKIP=17083 DELTA= | | 40647 | | | 40647 | .929325 | |
| ** | 06A0 | 201F1080 63FBCEA3 | MTR EXTERNAL | - NEW= 395 SKIP=12997 DELTA= | | 16771 | | | 16771 | 01:15:06.0 | |
| | 08A8 | 402F1080 22FBE494 | PIT EXTERNAL | - NEW= 587 SKIP=86205 DELTA= | | | | 474072 | 66894 | .066894 | |
| | 08D8 | 302C1080 1CFBE591 | DUZ EXTERNAL | - NEW= 551 SKIP=80095 DELTA= | | | 477283 | | 2443 | .069925 | |
| | 0D88 | 204A1010 28FC0EC3 | MJC EXTERNAL | - NEW= 910 SKIP=75891 DELTA= | | 196263 | | | 125786 | .196263 | |
| | 0FF8 | 20391010 1FFC1F98 | PCE EXTERNAL | - NEW= 706 SKIP=29482 DELTA= | | 50710 | | | 50710 | .247884 | |
| | 10F0 | 202A1010 1FFC25F1 | PCE EXTERNAL | - NEW= 527 SKIP=14555 DELTA= | | 18760 | | | 18760 | .267351 | |
| | 13C0 | 20161010 16FCBAD6 | DDM EXTERNAL | - NEW= 287 SKIP=29529 DELTA= | | 63552 | | | 63552 | .331430 | |
| ** | 17E8 | 202E1080 67FC5E02 | MAT EXTERNAL | - NEW= 575 SKIP=40575 DELTA= | | 107577 | | | 107577 | 01:15:06.5 | |
| | 1A78 | 40241080 1CFC7588 | DUZ EXTERNAL | - NEW= 455 SKIP=73387 DELTA= | | | | 444530 | 72141 | .512012 | |
| | 1A90 | 305210B0 66FC766A | MOU EXTERNAL | - NEW= 1006 SKIP158898 DELTA= | | | 444051 | | 2060 | .514528 | |
| | 1AE0 | 20541010 68FC7880 | HTM EXTERNAL | - NEW= 1030 SKIP=32345 DELTA= | | 81246 | | | 5582 | .521117 | |
| | 1FE8 | 20281004 23FCADDD | PNA EXTERNAL | - NEW= 539 SKIP=60856 DELTA= | | 159401 | | | 159401 | .681549 | |
| | 2148 | 20271010 23FCDA1A | PNA EXTERNAL | - NEW= 491 SKIP=19275 DELTA= | | 39640 | | | 39640 | .721729 | |
| ** | 2518 | 20281080 23FCF781 | PNA EXTERNAL | - NEW= 539 SKIP=39401 DELTA= | | 188392 | | | 188392 | 01:15:07.0 | |
| | 2718 | 30391080 14FDDCLD | KAT EXTERNAL | - NEW= 706 SKIP=84432 DELTA= | | | 460200 | | 64582 | .064582 | |
| | 2730 | 40281080 1CFDDD3F | DUZ EXTERNAL | - NEW= 503 SKIP=97898 DELTA= | | | | 464249 | 275 | .065564 | |
| | 0000 | 27482744 03002336 | 00000000 00000600 | 0000008A 2FEB3826 | 00000000 00000000 | 00150708 | 00150710 | 00000000 | 00000000 | | |
| | 0030 | 00002336 00000000 | | | | | | | | | |
| | 08C8 | 20301010 4EFD5130 | CRJ EXTERNAL | - NEW= 598 SKIP101396 DELTA= | | 273927 | | | 207859 | .273927 | |
| | 0AD8 | 20241010 0BFD6273 | CJP EXTERNAL | - NEW= 455 SKIP=29577 DELTA= | | 52339 | | | 52339 | .326866 | |
| | 0F88 | 20301004 0EFD8F89 | CSF EXTERNAL | - NEW= 598 SKIP=52195 DELTA= | | 138389 | | | 138389 | .465711 | |
| ** | 1000 | 202C1080 0EFD97F0 | CSF EXTERNAL | - NEW= 551 SKIP=19407 DELTA= | | 24750 | | | 24750 | 01:15:07.5 | |
| | 1338 | 30411080 0EFDAEC2 | CSF EXTERNAL | - NEW= 802 SKIP160372 DELTA= | | | 495600 | | 69278 | .560889 | |
| | 1350 | 40291080 0CFDAF1D | CRJ EXTERNAL | - NEW= 515 SKIP163415 DELTA= | | | | 495911 | 287 | .561880 | |
| | 1748 | 20311010 30FDJD9E | MJR EXTERNAL | - NEW= 610 SKIP=66786 DELTA= | | 212987 | | | 142103 | .704598 | |
| | 1830 | 20301004 30FEJ27F | MJR EXTERNAL | - NEW= 598 SKIP=39257 DELTA= | | 112489 | | | 112489 | .817698 | |
| ** | 1F78 | 201E1080 63FE3819 | MTR EXTERNAL | - NEW= 383 SKIP=50686 DELTA= | | 163786 | | | 163786 | 01:15:08.0 | |
| | 2180 | 302A1080 20FE4D16 | TJR EXTERNAL | - NEW= 527 SKIP=98197 DELTA= | | | 484758 | | 63983 | .063983 | |
| | 2188 | 40341080 1CFE4D1A | DUZ EXTERNAL | - NEW= 646 SKIP114765 DELTA= | | | | 484004 | - 479 | .064031 | |
| | 2360 | 204F9000 28FE5CEF | MAR DISPATCHER | - NEW= 970 SKIP=33507 DELTA= | | 112585 | | | 47906 | .112585 | |
| | 23C0 | 204C9000 28FE5FEC | MAR DISPATCHER | - NEW= 934 SKIP= 3210 DELTA= | | 8194 | | | 8194 | .121749 | |
| | 23F0 | 20479000 28FE6106 | MAR DISPATCHER | - NEW= 874 SKIP= 1844 DELTA= | | 2443 | | | 2443 | .125128 | |
| | 2588 | 404C9000 28FE7059 | MAR DISPATCHER | - NEW= 934 SKIP=36286 DELTA= | | | | 107445 | 46121 | .172124 | |
| | 2580 | 404A9000 28FE7130 | MAR DISPATCHER | - NEW= 910 SKIP= 982 DELTA= | | | | 1641 | 1641 | .174730 | |
| | 2680 | 40539000 28FE7768 | MAR DISPATCHER | - NEW= 1018 SKIP= 7858 DELTA= | | | | 18197 | 18197 | .193807 | |
| | 2688 | 20311010 0EFE779F | CSF EXTERNAL | - NEW= 610 SKIP=21048 DELTA= | | 68428 | | | - 395 | .194430 | |
| | 26A8 | 40499000 28FE7859 | MAR DISPATCHER | - NEW= 1856 SKIP= 1006 DELTA= | | | | 1832 | 1617 | .196658 | |
| | 0000 | 27482744 03002338 | 00000000 00000600 | 00000088 2FEB3826 | 00000000 00000000 | 0015FE18 | 0015FE20 | 00000000 | 00000000 | | |
| | 0030 | 00002338 00000000 | | | | | | | | | |
| | 0220 | 40659000 28FE8FE2 | MAR DISPATCHER | - NEW= 1233 SKIP=27601 DELTA= | | | | 70320 | 70320 | .268836 | |
| | 0240 | 40709000 28FE90C7 | MAR DISPATCHER | - NEW= 1365 SKIP= 922 DELTA= | | | | 1509 | 1509 | .271579 | |
| | 0498 | 203E9000 28FEA6FC | MAR DISPATCHER | - NEW= 766 SKIP=67062 DELTA= | | 144642 | | | 66738 | .339684 | |

FIGURE 5–7. SEQUENTIAL ACTIVITY REPORT (SHEET 3 OF 3)

## 5.8 Priority Two Message Response Time Report

On the CFC Project, there is no data with which to generate this report. The input data is initiated by radar hardware, not used on the CFC Project.

## 5.9 SMI or TESTDATA

As an option, an SMI or TESTDATA formatted tape, which can be used to produce CPU histograms similar to those available from SMI data, is output.